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Amiga Goes To Work:
Accounting Revolution from B.E.S.T.

THE Guide TO COMPUTER LIVING

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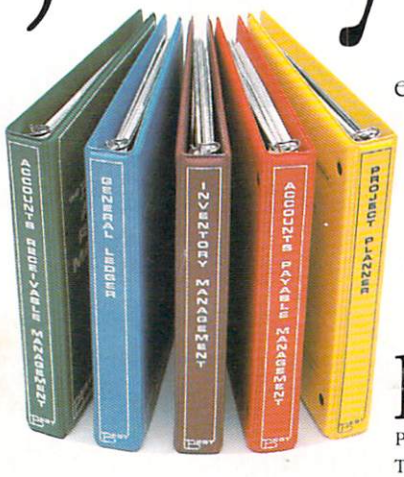

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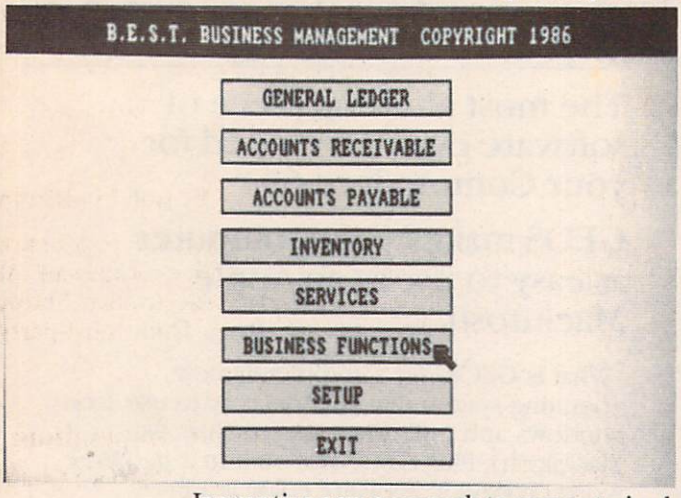

Innovative new approach to computerized accounting is debuted in B.E.S.T.'s new Amiga release. Randy takes a pre-release look at what may prove to be the computer program of the year, and interviews the head of the design team responsible for its creation.

The cover art, "Pagoda", was created by Wayne Schmidt with **Flexidraw** in Hi-Res mode, on a C-64.

The Guide features high quality original artwork on the cover each month. All artists are encouraged to submit their computer artwork for consideration. The only restriction is that the art must have been created using a Commodore computer. This could be your chance to move that masterpiece from the screen on your monitor to the newsstands of America! And make a few dollars in the process.

Please submit all artwork on disk, with a cover letter describing the graphics package used to create it. It will be photographed from the screen, so screen dump capability is *not* a requirement.

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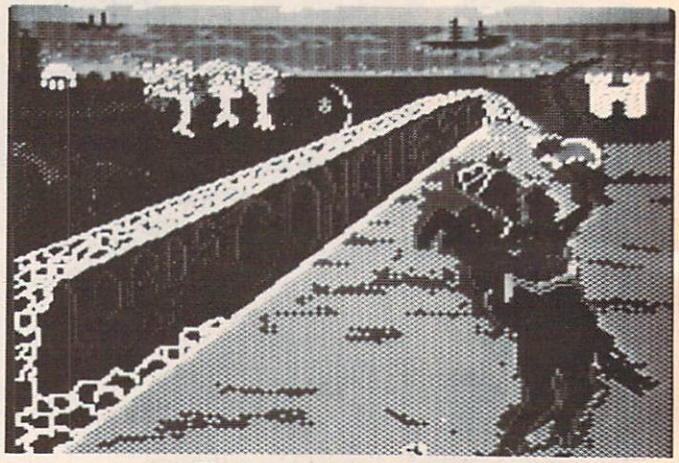

Electronic Arts converts a classic board strategy game to the C-64 and comes up with an even *better* computer strategy game.

The Guide To Computer Living

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Letters to the editor are not only welcomed, but encouraged, and will be printed as space permits.

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September 1986

RND (0) Notes:

B.E.S.T. Legitimizes The Amiga As A Serious Business Computer

by Randy Chase

It's been a year now since our friends in Pennsylvania formally released the Amiga, supposedly marked their entry into the world of small business computers. They reasoned that the Amiga had both the power and the versatility to succeed where the Mac failed, and could seriously threaten the dominance of the IBM PC in the business community.

I was even so bold as to predict that the Amiga had the potential to one day become the standard against which the PC would be compared. When I made such a rash prediction, however, I wasn't quite expecting the marketing strategy (or lack thereof) that Commodore has displayed in the last year.

Who could have imagined that Commodore would release this marvelous new "business" computer only to stumble around aimlessly while the consumers waited for the release of a data base (good or otherwise!) and a professional-level word processor. And then, of course, there were no business application programs available that would seriously tempt a business to even consider purchasing an Amiga.

Fortunately for Commodore, the appeal of owning the most fascinating technological wonder of the computer age has generated enough sales to keep Commodore afloat and the Amiga alive. The number of people who are confident enough to buy the Amiga and wait patiently for software grows smaller each time someone purchases an Amiga. Technologically, the Amiga is indeed capable of becoming a dominant factor in the marketplace. However, if this potential is to be reached it's time for the needed software to evolve from promises to commodities on retail shelves.

The anniversary of the Amiga's release still finds Commodore stumbling like a punch-drunk fighter on his last legs. In a year, Commodore still hasn't quite decided what they are trying to do with the Amiga. During the Consumer Electronics Show in Chicago, one prominent CBM executive said that the targeted buyer for the Amiga is the same person who drives a Mercedes! The Amiga is still waiting to take the world by storm, but it's having a hell of a hard time doing it without the support of an agressive (and realistic!) marketing program.

Fear not, for as so often in the history of Commodore, they seem destined for survival in spite of themselves. Just at the time when the Amiga is beginning to lose momentum due to the lack of serious software, the software industry seems poised to come to the rescue with the kind of applications that can breathe life into Commodore's posturing about the Amiga's vitality as a business machine.

Most of the major companies are still supporting a "wait and see" attitude regarding software development. It is these major software giants who are expected to provide the breakthroughs and set the standards in the *serious*

computer markets. But where is Borland? Or Ashton-Tate? Or Lotus? And where is MicroSoft when their remarkable Amiga BASIC so desperately needs a compiler?

The lack of action on the part of these industry leaders has created a window of opportunity, and several smaller companies are showing the willingness, the ability, and the nerve to crawl through that window. A year ago we'd never even heard of Aegis, and now they are setting the standards for graphic utilization of the Amiga. Precision Software has firmly entrenched themselves as one of the leaders in the Commodore 64/128 world, and they are about to assume an enviable position in the Amiga marketplace with their newest version of **Superbase.**

Ironically, what may prove to be the most revolutionary software developement of the 80's isn't coming from Lotus or Ashton-Tate. It is coming instead from Business Electronics Software & Technology, Inc. (B.E.S.T). And, in its initial release it isn't even going to run on an IBM (although that will follow later in the year). B.E.S.T., in releasing their **Business Management System** for the Amiga is completely redefining the way computerized accounting and business management have been approached.

I have an uncomfortable habit of crawling out on a limb and sawing it off behind myself, but I'll go so far as to say that the **Business Management System** will prove to be the biggest single step forward in software since the release of 1-2-3 by Lotus. Every company marketing accounting software is going to be forced to re-evalute their product line, and every businessman using a small computer is going to have to ask himself if he wouldn't be better off with an Amiga running this software.

The obvious winners are Commodore and the Amiga dealers. At last, the small businessman is going to be given a good reason to buy an Amiga. Software powerful enough to alter radically the way he approaches managing his business, combined with a competitive price (compared to IBM), will provide dealers with a marketing package that could make the Amiga an automatic sale for the fall.

GEOS & The 64C — Second Thoughts . . .

After having some time to reflect on the *new* 64, I feel that perhaps I should temper my initial reactions. While I'm still not crazy about the price increase, I do think the new computer is cosmetically more attractive than the *old* 64 (which never did look like a computer), and even in the prettier plastic and sporting a higher price tag the 64 will remain the most economical home computer on the market. And we all know just how underestimated the power of this Model-T of the technological age truly is. If the $200 price tag helps keeps Commodore afloat long enough for the Amiga to find its niche, then the additional dollars will be well-spent by consumers in the long run.

I still have a hard time handling Commodore's idea of bundling GEOS with the 64C. The concept is fine; I've always been an advocate of computers that actually *do* something when you take them out of the box. I guess what I have a hard time digesting is Commodore's over-hyped comments about a "revolutionary" new operating system. It's a very nice little software package that will enhance the out-of-the-box value of the 64C to the first-time computer owner. Let's just not get carried away with the over sell and needlessly hang an albatross around its neck. Next month we'll be taking a much closer look at both the strengths and weaknesses of GEOS.

Amiga Update

Amiga sales figures remain a closely-guarded secret. No one seems to want to talk about any kind of specific numbers. Clive Smith at Commodore, however, was willing to say that the Amiga "has regained momentum" and that they've had their best quarter to date for Amiga sales. He cited three factors for the resurgence of sales: the price promotion, the inreasing availability of software, and the Amiga's release in Europe. What kind of numbers that translates into can only be speculated upon. One unoffical source did say that the first shipment to Europe was 8,000 units which sold out in the first two days.

Reportedly, these units went predominantly into business environments rather than homes. It will be most interesting to see what kind of acceptance it sustains in the European market, where Commodore was never shackled with that damning Toy 'R Us image. It is our hope that the release of products like the **Business Management System** will change that image for the better over here.

There is also some promised activity in the development of music software fot the Amiga's hi-tech sound system. **Music Studio,** while it does have some very serious short-comings, is so far the most sophisticated musical package available. **Musicraft** is far superior, but until it exists in more than a partially implemented demo form, **Music Studio** remains the most-used creative tool for Amiga musicians. Judging by the files I've been downloading from the various networks, the program is capable of some impressive accomplishments. A couple of gems I discovered over the weekend were a nine-minute Brandenburg Concerto and a delightful "Whiter Shade of Pale" (both from the

Amiga Forum on CompuServe).

Commodore, how about a release date for **Musicraft**? And when are we going to see **Deluxe Music** from Electronic Arts? We've gotten the tease, now let us get down to business with some software sophisticated enough to fulfill the musical promise of the Amiga.

C.E.S.

Now that C.E.S. is month-old history, a few reflections might be in order. All in all, it was a very disappointing showing for Commodore. What could have been a show dominated by the Amiga, or perhaps a show of strength and expansion for the 64/128 market, was instead lost in the confusion of whether or not they were even going to participate. Only hours before the show, Commodore was saying that they would *not* be there. That isn't the way an industry leader goes about projecting an agressive, dominant posture.

I've already been critical enough of their decision *not* to show the Amiga at C.E.S., so we'll let that rest. I do, however, wonder why they didn't show the new 3½" drive and other new peripherals for the 64/128 line. It would have strengthened and reinforced their introduction of the redesigned 64. All in all, they gave the impression that showing up was an after-thought, and as a result. They wasted a precious opportunity to strengthen their image and position. In times as precarious as these, I have to think that they can't afford to let such opportunities slip past. Considering their impressive showing at Comdex, it just didn't make sense that Commodore approach C.E.S. with so little preparation and polish.

The Guide On-Line ...

I'm very pleased, and excited, to announce that *The Guide* is going to be actively involved with CompuServe. By the time this issue reaches you, we will be online with an electronic version of the magazine. We'll look forward to running into many of our long distance friends on the network, and will have more details about what will be happening with *The Guide* electronically in the next issue.

Changes In The Family ...

As our old-time readers know, *The Guide* has been produced by a very small and consistent core of people. Two summers ago we ceased to be a one man operation when Bill Wallan enlisted to handle the production. John Olsen and Grant Johnson both began contributing about the same time, and were followed closely by Mindy Skelton and Shelly Roberts. Since that influx of energies and talents, there have been almost no changes in the core group that have made *The Guide* possible each month.

I'm quite pleased to introduce the newest member of our editorial team. Bob Lindstrom has joined our regular staff, and over the next couple of months will be assuming the bulk of the editorial control of *The Guide*. Many of you in the industry, and most of you in the Northwest, are probably familiar with Bob from his nine years with the *Oregonian*, Oregon's largest newspaper, where he doubled as the resident computer expert and the classical music critic. He brings with him the freshness of approach that can come only from the input of a new perspective, and has many surprises planned for future issues. Look for the November issue to be a knock-out. It will be an issue dedicated to the theme of computer sex! I don't think anyone will want to miss that one.

One of the side effects of Bob's assuming many of the editorial responsibilities that I've handled in the past is that I will be free to explore some new areas. My first new project, The Sports Corner, will debut next month and will focus on activity in the computer sporting world. Next month we'll take a look at SubLogic's **Pure Stat Baseball** and the release of Lance Haffner's *great* simulations for the Amiga.

Well, Bob tells me that I've used up all of my room this month, so until next time . . . .

■

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B.E.S.T. Puts Amiga To Work!

Innovative Business Management Sets New Accounting Standards

by Randy Chase

Accounting software is the most traditional and least exciting of all computer applications. Only an accountant can honestly say that he or she enjoys using the stuff, but then we know that they aren't quite normal in the first place or they wouldn't be accountants, right? This is the one refuge of software development where the words "user friendly" are never spoken; after all, this is "business" software we are talking about, right?

For the Fortune 500 companies, with their mega-budgets and rooms of neatly pin-striped accountants, software is no problem. They just buy a main-frame computer, budget some six digit dollars for customized software, and then turn it all over to the accounting department. For the rest of the business world, though, accounting remains both the reason they spend their preciously sparse dollars for a computer and the reason they end up wondering why they wasted their time and their money.

Most accounting systems have fallen into one of two categories: those that are powerful enough to handle the work, but complex enough to need a full-time in-house accountant to interface between the software and the business; and the system that is understandable and usable, but too limited in power and versatility to be of any real long term value. It seems that they were designed by programmers who had no idea how the average person approaches his business and what his unique needs might be, or, they were engineered by software technicians who didn't know the difference between a purchase order and a credit memo.

The victim of these diverse system philosophies is the small businessman. He typically is the customer who most needs the advantages and benefits that should result from converting his records to the computer. First, though, he finds that a computer capable of filling his needs far surpasses his budget. After all of the compromises are made, he most likely ends up with hardware that is both marginally effective and far more expensive than he could really afford. Software? Well, most likely he'll end up using an "integrated" system that utilizes a variety of different modules (all, of course, equipped with their own individual price tags) that requires a never-ending game of musical disks in and out of the drive and a series of shuffling and tranferring of data between the various "integrated" program modules.

The end result is that while it does manage to fill a variety of the accounting-related needs, it will invariably require yet another series of compromises. It seems that most software was designed by people who had all the answers. They knew just was needed by everybody and in their superior wisdom provided for all of the conceivable options a person might require. When the non-understanding customer tries to implement his current manual record-keeping system (which, we should mention, is most likely working quite effectively for him) into the confines his new software, he discovers that the process of compromise has only begun. Now he must find ways to structure the data that his particular business generates into a pre-determined format. Even worse, with most software, the output is also predefined. In many systems, the *only* control you have in the design of the reports you can extract from your records is in the initial design of the chart of accounts.

What small businesses really need is two-fold: 1) a powerful and versatile machine that is capable of offering them *big company* computing power and state-of-the-art versatility at *small company* prices; and 2) software that is sophisticated enough to truly solve his record keeping needs, versatile enough to mold itself around the intricacies of his business, yet easy enough for the average person not only to use, but also to truly master. The company that could fill that entire order, with a system bundled together and priced at

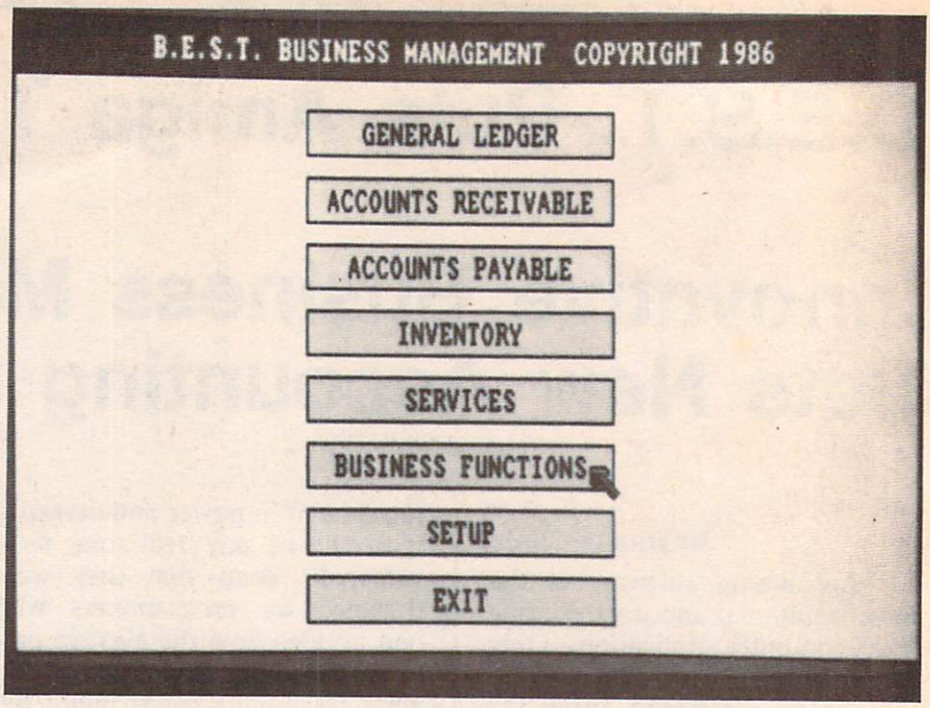
under $2000 would surely have an immediate impact of a very serious magnitude in the small business marketplace.

In spite of Commodore's year-long attempt to convince the world that the Amiga *is* indeed something more sophisticated and serious than just "the world's most incredible game machine", the business world hasn't been listening. The only alternative they have been considering is whether to buy a "compatible" or get the "real" thing. Commodore, as we're all painfully aware, doesn't have the best of images when you start talking about business machines. While the Amiga may be undisputedly the best technological wonder available, those who are buying computers to solve specific business needs want practical results right now, not promises of what the future will hold.

Those grandiose promises of the future, however, are now arriving. The Amiga is going to be legitimized as a very serious business contender shortly after her first birthday.

With the release of their ambitious **Business Management System**, B.E.S.T. (Business Electronics Software & Technology) may prove to be the company that puts the Amiga on the sales charts in that "serious" side of the market that Commdore has never managed to broach. Offering what may be the most comprehensive combination of business management and accounting tools available for a small (i.e. affordable) computer, the Business Management System instantly transforms the Amiga from a technopop-toy into a very serious business computer. This array of software tools is bundled into a format that is so deceptively easy to use that the magnitude of power hidden behind the friendly screens is at times hard to fathom.

The artful blending of the power of the Amiga with the sophistication of the software engineering (yes, something this fast and sleek isn't programmed, it's truly engineered!) provides the user with what may be the most versatile and productive dollar value in the industry. B.E.S.T. has handed Commodore the missing ingredient that will force the Amiga into that IBM dominated spotlight in a most competitive way.



Initial menu for B.E.S.T.'s Business Management System, providing options for both traditional accounting options and friendly business functions.

Shattering almost every stereotype in the books, BMS dares to offer a whole new approach to automated record keeping. While accounting is a major by-product of the system, this is not just another accounting package. The easy to follow menus guide the user through a very simple appearing series of business functions, but every click of the mouse sets in motion waves of underlying activity. Existing on a secondary level is the most comprehensive integration of accounting functions on the market. Invisible to the user during the completion of most ordinary business tasks, a truly integrated accounting system is working in the background.

Unlike the traditional "integrated" systems, B.E.S.T. offers one program that loads into memory and contains not only the General Ledger, Accounts Receivable, Accounts Payable and Inventory, but also offers Order Processing and Invoicing. These are not independent modules which load in and out of memory and trade data back and forth. This is one program, carefully designed to harness the power of the Amiga and provide a one-stop solution to the computer problems of business management.

The focus of the user, however, is directed away from the drugery of double-entry bookkeeping, and instead allows the user to concentrate on those tasks that are a normal part of his business. Accounting isn't a natural business practice, according to B.E.S.T. president Harold Chadwick. "People don't do accounting. They do business stuff.

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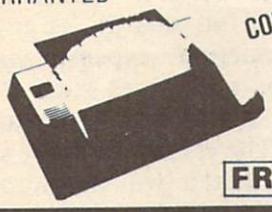

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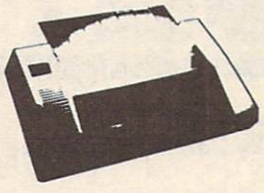

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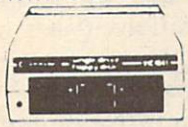

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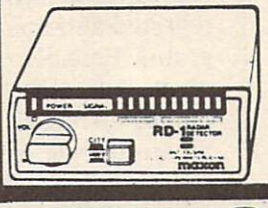

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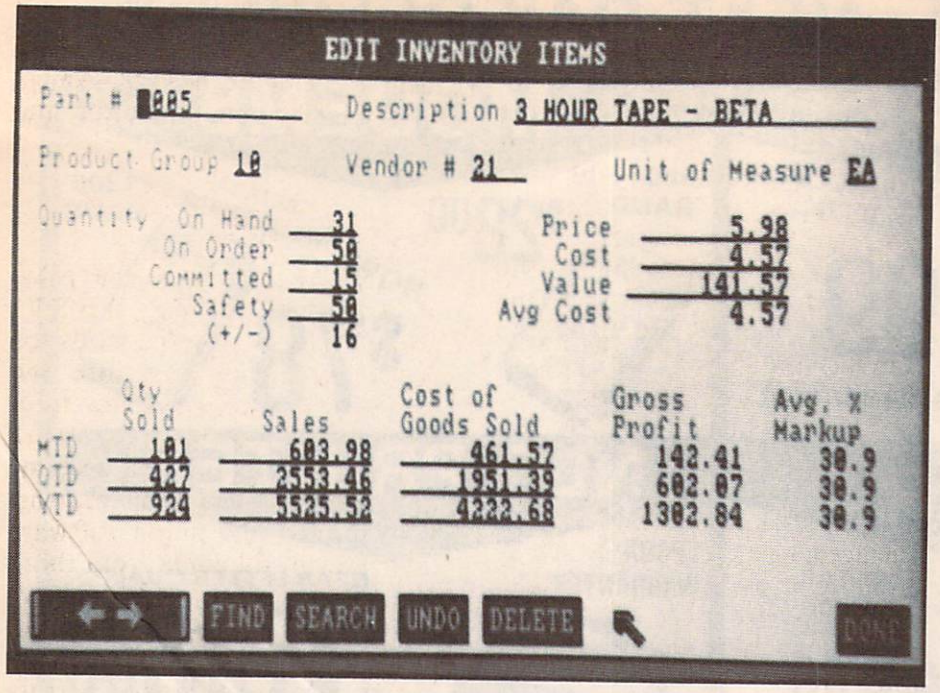


Inventory records reflect not only product in stock, but on order as well. Sales cost and profit information by item is also stored here.

They sell things. They buy things. They pay bills." This software frees the user to do that "stuff" while the computer follows along and does the accounting for him.

As a management system, rather than a traditionally designed accounting package, B.E.S.T. also offers the user the dynamic ability of being able to extract a vast range of information from the system. With the report generating capabilities provided, the user is free to utilize reports that fill the particular needs of his business, rather than learning to live within the predefined or limited structure of the output of many systems.

Aside from the true integration and friendly design, perhaps the most significant factor with the Business Management System is the price. With the complete B.E.S.T. package retailing for only $395, it provides a very attractive alternative to the traditional IBM option. In the IBM market, integrated software comes in separate modules, falling into the $500-per-disk range. Covering just the basics of Payables, Receivables, General Ledger and Inventory, the software costs alone quickly equal or surpass the total system price of the Amiga and the B.E.S.T. software. If you include hardware costs, putting together an IBM system matching the hardware and software capabilities of this system will result in a price tag in the $4000-5000 range.

Even at the higher price, the IBM system just wouldn't be competitive when you compare the traditional design of "integrated" software, with B.E.S.T.'s truly integrated and memory resident program. Between the price advantages and the superior performance offered, this is the combination that Amiga dealers have been looking for. At last they can set an Amiga side-by-side with an IBM and sell the prospective buyer both the best budget fitter and the superior management tool.

The Business Management System is a one-window, non-multitasking package, using multiple menu screens to guide the user through the gauntlet of daily business functions. While all of the traditional accounting functions are directly accessible from the main menu, the vast majority of the user's time will be spent in the sub-menu of Business Functions. Here are contained task related work screens for issuing Purchase Orders, receiving freight into inventory, check writing, order processing, invoicing, receiving payments from customers, and processing sales returns. Once the initial set-up of the system is complete, the user will seldom need to enter the accounting mode; although it is always there at the click of the mouse for such things as entering depreciation expenses into the ledger and other such "accounting" tasks that occasionally arise.

The versatility of the system is such that it will accommodate a wide range of businesses comfortably into its structure. The inventory system is designed to handle the traditional inventory functions, and is also complimented with service management capabilities that will support both rental operations (such as movie rentals) and hourly service charges (such as repair work).

An impressive example of the big computer capabilities packed into the Amiga by this management tool is the invoice management approach in the Accounts Receivable. It is capable of handling a variety of invoice terms, discounts and late charges for an individual customer, with the current amount due being derived from the combination of terms and conditions of the various invoices in the aging process. While this in itself is nothing new, to arm your PC with this level of cash flow management capabilities is going to require looking at those $500 per module software packages. Providing these kinds of management tools at a price that is affordable to the smaller businesses who, until now,

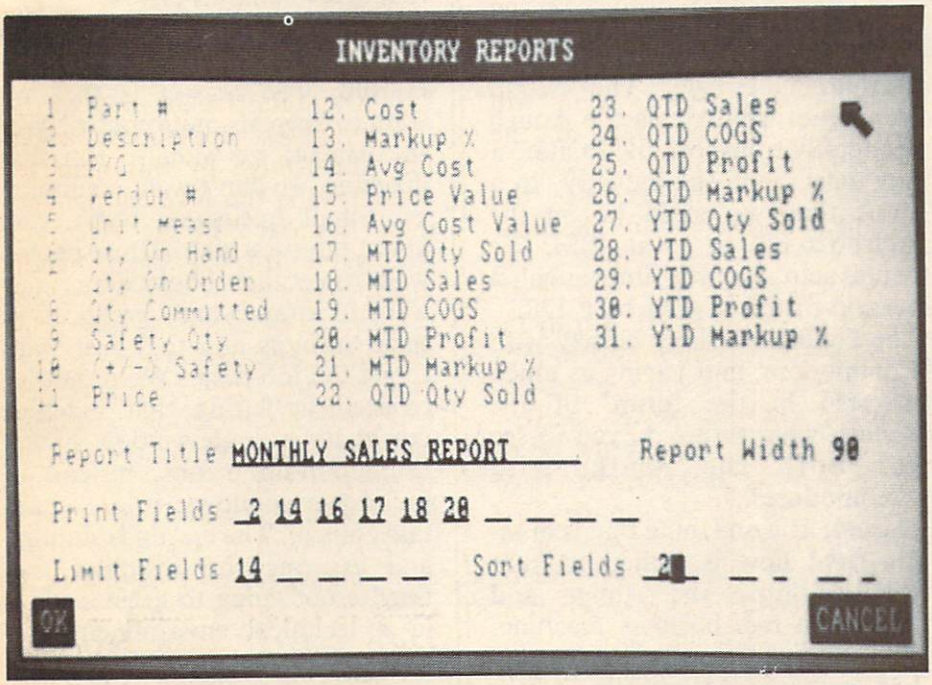
couldn't really afford the ante to join the IBM world, is going to earn both B.E.S.T. and Commodore an enviable share of the market.

With the capacities of the Amiga disk drive and the provisions for expanding to a hard drive, B.E.S.T. can not only serve the immediate needs of the small business but also expand upward to encompass an almost staggering level of business activity. Disk storage capacities are allocated on demand by the system, which means that a users unique needs and uses of the software will dictate the actual use of the storage capacities of his hardward configuration.

B.E.S.T. cites storage capabilities of a "typical" configuration utilizing a single disk drive as handling 150 general ledger accounts, 1500 transactions, 150 customers, 50 suppliers, 1500 inventory items and 100 open orders. These are not limits, but simply examples of a possible use of the storage capacities of the system. To get a perspective on the potential capacities with a hard disk system, multiply the capacities mentioned twenty-fold.

By providing variable file lengths B.E.S.T. offers a system which responds to the requirements of the specific business. It allows users to use data disk space according to the needs of their business. One business may require large amounts of data storage for extensive inventory, while another may be customer intensive and, instead, utilize that space for accounts receivable.

As all-encompassing as this management system is, B.E.S.T. promises up-grade modules later in the year to cover payroll and business analysis graphics. These will integrate into the current package, and will be available to users at a nominal charge. At the time of their release, they will be incorporated into the main package for new customers, again maintaining the continuity of a one program does everything approach, rather than a series of modules.



Inventory reports are easily designed from a screen of options, with options for combining a variety of fields, as well as sorts and limited ranges.

System requirements to run the B.E.S.T. Business Management System are a 512K Amiga with an 80-column monitor and printer.

In Conclusion . . .

Considering both the price and the performance, B.E.S.T. not only has set new standards for developers trying to utilize the Amiga as a serious business tool, but also are redefining the entire concept of computerized accounting and business management. It's expected that major software innovations will come from those corporate giants with seemingly unlimited R & D budgets and teams of engineers, and, of course, it's expected that a truly revolutionary new business tool *will* be designed for the IBM family. That perhaps is what makes this release even more remarkable. Designed for the Amiga by a small company in McMinnville, Oregon, and programmed by a single programmer armed with his own development system, the Business Management System may prove to be the most revolutionary business tool since the release of Lotus 1-2-3.

The design of this high-level business tool is a significant enough advance in software engineering to make this the product of the year not only for the Amiga, but for any machine competing in the small business marketplace.

If Amiga dealers, armed with this software can't penetrate the IBM dominated market, they'd better start examining their sales techniques. The Amiga provides the computing power, and B.E.S.T. has harnessed that power and channeled it into the most productive and friendly business application on the market. The $2000 multi-purpose business machine has arrived.

■

A Conversation With B.E.S.T.'s Harold Chadwick

Harold Chadwick is the president of Business Electronics Software & Technology, Inc., and the leader of the innovative development team that is releasing the most ambitious Amiga product to date, The Business Management System. In this interview, conducted by Randy Chase, Harold offers insights into the future of both the Amiga and automated accounting.

The Guide: Why do you think that, especially in the IBM world, no one had successfully filled the need for an accounting package that combines both power and ease of use?

Harold: Most of the systems in the past were typically dominated by accountants and were excellent accounting pieces but they were impossible for the average person to use. On the other hand, there were those developed by a programmer with help from an accountant. Many times a showmanship of technical talent resulted rather than a simple tool that gets a job done. We tried to get rid of all that technical trash and hide it in the machine and the program where it belongs. We're not trying to prove anything to anybody we just want a tool that works. I think that's been the mistake all along.

The Guide: Before we talk about the actual system, let's talk about the Amiga. Yours may be the most amibitious project underway for this machine. Weren't you somewhat nervous spending so much time on a machine that many people think isn't going to make it?

Harold: Look at the flip side. A lot of people have stayed away from the Amiga because they are afraid of it dying. We've immediately lost half the competition, and have a lot more potential for a larger segment of the market faster than perhaps with any product in the history of the industry. If our package is good, and we believe it is, it's going to be very tough for someone to catch up when they start having second thoughts about the viability of the Amiga.

The Guide: Being a small company, aren't you taking a considerable risk supporting the Amiga with so many questions being asked about Commodore's chances of survival?

" . . . we keep absolute control over the Amiga; we want to run the machine, we don't want it running us . . . "

Harold: Not true! The design techniques we used on the Amiga are totally transportable to almost any machine in the industry. In a short time we could be on the Atari 520 ST, or on an IBM. We could actually even implement a version of this system on a 128.

The Guide: Working closely with Commodore, and having as much invested in the future of the Amiga, what future do you forsee for both the Amiga and Commodore?

Harold: The one thing that is missing right now is something that will legitimize the Amiga and make it a *real* business machine. That was the trouble that Apple had with the Macintosh; it was never legitimized in the business field. The IBM was, of course, and became the standard of the industry. I believe that since the product we are implementing is literally the state-of-the-art in both the software industry and in the business field and again at the *same* time, it is possible that we can be the ones to legitimize the machine for Commodore in the business market.

The Guide: Do you think that CBM can overcome their current problems and successfuly market the Amiga?

Harold: I think they have been hampered by both management and financial problems, but I think that given some sales to generate some adequate cash and, subsequently, the freedom to do the things they need to do, they're going to pull it off.

The Guide: One criticism that is going to be made of your system is that it's not multi-tasking, which is one of the selling features of the Amiga. Why?

Harold: The reason is that we want to keep absolute control over the Amiga; we want to run that machine, we don't want it running us. Small businesses don't care about multi-tasking. Those people want to get their books done, they want to know what's going on in their business and they just want to get the job done. We're not interested in letting that machine crash! It's a single window system using pop-up menus, instead of pull-down windows, so we maintain control. The reason is stability and assuring the customer that they're not going to get mixed up in a technical environment that they're not prepared to handle. We'll deal with multi-tasking another time, but not in this version.

The Guide: What is the biggest difference between your Management System and the traditional accounting systems?

Harold: Accounting is a by-product of a person running his business. We wanted to allow the person at a very high level to do the things that they do well, and underneath all of that the accounting process happens automatically.

The Guide: Rather than being modular in design the B.E.S.T. system is truly integrated. What is the key to getting all of this this into memory?

Harold: With the previous technology, you couldn't do that much processing at one time without dragging the machine down. The new machines, particularly the Amiga are fast enough that much more processing can take place in such a short time that it's not even apparent to the user. We are redefining the term integration. To us it is not just passing the results of the payable system to the general ledger. Our concept of integration is to have them all in memory at the same time, with all of the actions taking place instantly. This is accomplished becaue we can now do that much processing on the Amiga, and because we have been able to pack huge amounts of code into very very small packages. As an example, a comparable general ledger on an IBM might take the full capacity of the PC to manage that system, yet we now can run the entire general ledger in only 20K on an Amiga.

The Guide: Is that a result of the hardware design of the Amiga or of your development system?

Harold: Both. The architecture of the Amiga is such that it can process information fast enough to make it practical and at the development level we are able to compact large amounts of code into a very small amount of memory.

The Guide: With your 64 series, some people assumed that it was just too friendly to really be that powerful. Are you concerned that the ease of use of the Amiga system might seem *too* friendly to really be *that* powerful?

Harold: At first glance, the Amiga system could be perceived as being superficial and that's great, because that's exactly how your supposed to see it. We want all the complexities hidden inside, but I dare say that if someone could climb inside that box they would find out very quickly that it is a very powerful and non-compromising system.

" ... a comparable general ledger on an IBM might take the full capacity of the PC, yet we can run the entire ledger in only 20K on an Amiga ... "

The Guide: Let's talk about the concept of the design of your Business Management System.

Harold: We tend to work backwards. We start with a perfect product, and start working through the engineering capabilities of the hardware. We don't have a whole lot of little building blocks that we put together somehow, little pieces of code and modules. By starting with the overall design we are better able to match the hardware, software and application. We're not really that different, we just pay attention to our course.

The Guide: Could you give us some insight into the way your development system works and the development advantages it gives you?

Harold: Since getting the Amiga in September, we completed the design of the development system itself before we did any actual coding. We've developed a higher level design system using C that relates very closely to what many people call artificial intelligence. We really only spent about four months actually coding the system itself. Traditional design methods would have taken a team of five programmers at least a year working on a main frame to approach the level of what we've done on the Amiga.

The Guide: One of the more unique aspects of your system is the versatility of the report generator. Why such a different approach to generating financial reports?

Harold: We weren't developing an accounting system, we were trying to develop a managment information system to help the customer run his business all year long, not just provide the needed reports at tax time.

The Guide: Do you think the user will find the report writer intimidating?

Harold: Absolutely not! One thing we've learned from our experiences with our Commodore products is to never underestimate the user. You give the customer a tool that will do the job for them, make it as easy to use as possible, and give them a manual that is easy to read, in language that they can understand, and they'll take it on with a vengeance and they will make it work. We think the Amiga is actually going to be significantly easier to use than the Commodore report writers, and yet incredibly more powerful.

The Guide: Could you estimate the start-up time required in getting the system up and running?

Harold: I believe that within two days the average user will be getting significant results from the system. We made an enormous effort to insure that the new user gets a start very quickly, shows results immediateley, and, therefore, builds on his or her own confidence.

The Guide: Perhaps the single most ambitious feature of the B.E.S.T. system is the invoice management process. I had an IBM dealer explain to me last week that such a process just wasn't possible on a *small* computer. Could you explain both the approach to invoice handling and the secret to making it work.?

Harold: As I mentioned before, the Amiga has the capability to process enormous amounts of information very quickly. Most business systems typically work on the balance forward principle where the open balance at the end of the month is simply moved forward to the next month as your opening balance. That's OK, for some kinds of businesses, but our system is designed to support a great number of differing businesses, and all kinds of potential terms can be associated with sales. While one business might invoice everything NET 30, another might bill their customers on a NET 30 basis, but give them discounts for paying early. We wanted the system to be broad enough that it could handle the simple balance forward process and also be able to allow a small business to deal in the world of invoice terms with variable NETS, discounts and late charges. The invoice management method actually manages each invoice separately for every customer and handles all payments and credits against that invoice, under the controls of the terms that were assigned to that invoice, with differing terms possible for the same customer over different periods of time. It's an incredibly complex process and probably one of the most complicated things we've ever done as a team.

" ... they will realize that instead of just putting data into a machine, they will get back more information than they intially entered ... "

The Guide: What advice would you offer to the small businessman preparing to automate his business?

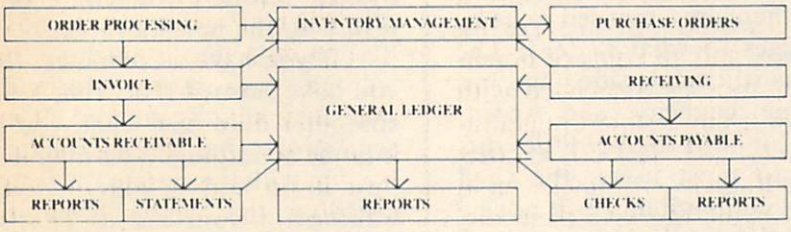
Harold: The whole process of automating a small business can be almost mind-boggling. It's a very very complicated and difficult thing for the average small business to convert their records from what they are currently doing, and what they know how to do. We call re-organizing their shoe box. Our approach has been to allow them to continue doing business the way they are, but to help them organize their shoe box in such a way that they begin to move away from the shoe box and into the computer. The computer tends to become their shoe box, and when they've gained enough confidence in the system, the computer will become their permanent shoe box. Only now they're getting more answers out of it than they were putting into it. As they begin to learn more about their business from their own system, they will realize that instead of just putting data into a machine, they will get back more information than they initially entered. It may even prove that the user actually has fun with the system, instead of dreading the whole accounting process.

The Guide: As you talk about having fun with accounting, I can hear CPA's and bookkeepers cringing all across the country.

Harold: We think the whole direction of accounting is going to change. What the accounting profession needs to understand is that because of the power and capabilities of the computers and software now available, small businesses are going to be able to handle more and more of their routine accounting themselves.

B.E.S.T. has hatched the new Amiga Business Management software to manage inventory, receivables, payables, order processing, general ledger...all in one.

Or put another way:



This is *the* integrated business management system designed *on* the Amiga *for* the Amiga. Now *one* software system can help you manage your entire business. It becomes an invaluable tool in managing cash flow, your inventory—and provides the reports you want *when* and *how* you need them.

Say you print an invoice. The computer automatically updates inventory, receivables, general ledger. Look at the flow chart. This is more than an accounting program; it is a system that makes information available for you to make management decisions.

Our business is to make your business easier to manage.

CALL 1-800-368-BEST for immediate information and response.

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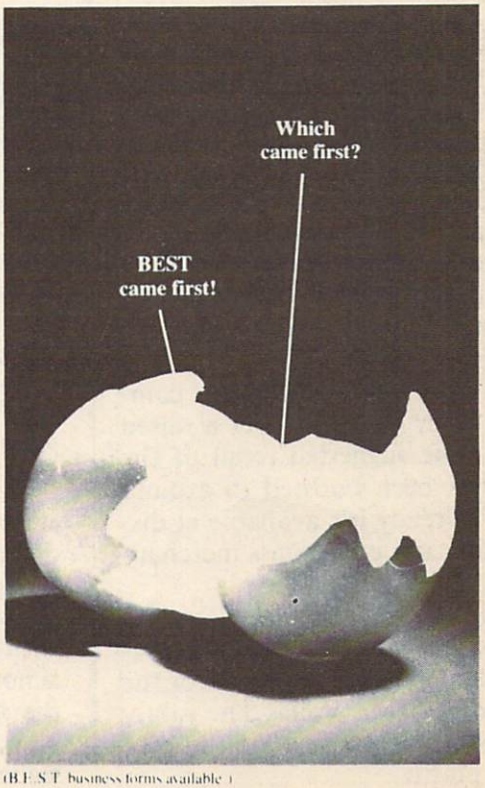


(B.E.S.T. business forms available.)

A New Look For An Old Friend

by Grant Johnson

After straying away from the world's most popular personal computer with the exciting Amiga and the disastrous Plus/4, Commodore was getting back to basics at the Consumer Electronics Show in Chicago last June by renewing support for the 64 and 128.

The introduction of a restyled Commodore 64 (the 64C), memory expansion for the C-128, an operating system that takes its cue from the desktop metaphors of the Apple Macintosh and, best of all, a faster, high-capacity 3½" disk drive suggests that Commodore is putting some muscle back into the machines that made it famous.

Longer . . . Lower

New for the current model year is the Commodore 64C. Note the elegant lines, the streamlined construction. This light beige beauty comes in a longer, lower, sleek new body. The keyboard is sloped towards the user and plunges daringly towards the supporting surface like last season's C-128. Gone is the box-with-a-rounded-side look familiar to six million 64 owners (and users of IBM commercial keyboard units). Notice the stylish and functional louvers on the hood.

With this raised sense of computer chic, however, goes a raised price. The suggested retail of the 64C has been boosted to around $250. Already it's available at discounters and other mass merchandisers for under $200.

The good taste that glamorized the C64 into the 64C also dictates a matching beige skin for the 1541 disk drive. Voila! The subtly shaded 1541C, a new look in disk drive plastic.

Style aside, Commodore goes out of its way to assure you that none of the good stuff under the hood has been tampered with. It is 100 percent compatible with the 64 — a claim that is easy to make since it *is* a 64. The keys are all in the same places, as are the power switch, game ports and the rest.

Perhaps the one change of real substance is the power supply. Commodore says that the one that comes with the 64C will not overheat during normal use. That alone could be worth the extra money.

Some liberties were taken under the hood of the new disk drive. The main thing you'll notice is that the head will be able find track zero without slamming against the stops. Gone is the spastic rattle that has alarmed new users and annoyed the experienced.

We are, however, to be treated to yet another design change in the drive's circuit board, though there are supposed to be be no changes to what it does. The format is still single-sided and has the same capacity and speed. Though it will make little difference to most users, the final word on compatibility will not be in until the combatants on both sides of the copy-protection war have worked their dark art in this new machine.

No brown shoes

Rounding out the basic ensemble is a new monitor with an old number. The 1802 number is now attached to a beige monitor. (You wouldn't wear brown shoes with a blue suit, would you?) This is not the dark grey 1802 that rode the Plus/4's coattails into oblivion. This one has a 40/80 column switch. The 80-column mode is a curious feature. It is monochrome only, and we are told that it cannot be used with the 64C's composite signal.

On the other hand, it will work with the monochrome signal from the RGB outlet of the 128; but the resolution is not up to the 128's high standards. I guess this $10.00 feature provides an answer to those customers who wonder, "Will this monitor work if I decide to upgrade to a 128?" Most probably it will supply the buyer on a budget with a fudge-factor solution to the 40/80 display needs of his 128. In any case, the color scheme of the 1702 is definitely passe and will no doubt disappear from the market out of shame.

More Good Looks

Whichever monitor 64C customers choose, Commodore has provided something really new for them to look at and work with. Graphics Environment Operating System (GEOS) will come on a disk with the new machine.

If you have a computer, then you have learned that what a new computer does best when you get it home is nothing. You plug it in, turn it on and it stares at you, waiting for your move. That's a problem when you haven't a clue as to what your move should be.

GEOS goes a long way toward solving this dilemma by immediately offering the clues you need. Briefly, GEOS is a graphic, menu oriented operating system that uses a high resolution screen. It may be used to manipulate disk files (load programs, look at directories, etc.); it also contains word processing and graphics software. It responds to keyboard, joystick and mouse cursor controls. If you're interested in retro-fitting a

Commodore 64C Microcomputer

new personality in your old C-64, GEOS will be available on disk for about $60.00. (*The Guide* will have more to say about GEOS in next month's issue.)

And while they were throwing disks of software in the box with the 64C, they tossed in a QuantumLink disk on the other side of GEOS.

Substance

It is easy to joke about matters of style and plastic haute couture; but at least with GEOS, we have begun to cross over into matters of real substance. Consider the impact on a new buyer. In the 64C he finds a slick-looking machine with a visual personality that is inviting to the beginner; one that runs thousands of programs and still is priced so low it has no competition. When you look at the basics, Commodore's moves begin to add up.

The irony is, as long as we were willing to buy C-64's by the millions, Commodore hardly acknowledged our existence. Years of complaints about the marginal power supply came to nothing while Commodore marketed at least four new machines in this country alone. The renewed attention Commodore is paying to the 64C should benefit all 64 owners.

Spelling relief

Most important are plans for an entirely new disk drive.

When the 1541 disk drive first came out it caused a minor revolution. The cost was about half that of the cheapest drive then on the market, and although it was slow, it was light-years faster than the cassette tape alternative. The 1541 was an enormous hit, and Commodore couldn't build them fast enough.

With the introduction of the 128 PC came the 1571 drive. This drive was considerably faster and had twice the storage capacity. Yet, it was compromised by the need for compatibility with the C64 and made more expensive by the need to read CP/M disks. Despite the versatility it gives the 128, the lack of 1571 speed hampered the 128's acceptance by non-Commodore buyers.

Commodore spells relief ('1581'). This new 3½" drive is more than twice as fast as the 1541 or 1571. The transfer rate when connected to a 64 (or 64C) is 500 characters per second and, when working with a 128, can be as high as 8500 CPI (burst mode). That works out to about a 60% speed increase. The 1581 will write double-sided disks that contain 737,000 characters of useful data. Best of all, you won't have to skip any house payments to get one. The predicted price is about $245 (the list for the 1571 is $279).

Other than its speed and capacity, the 1581 should seem very familiar to experienced Commodore hands. You can "daisy-chain" it into the serial port and switch it to operate as device 8, 9, 10 or 11. It is a smart drive and contains a 6502 processor just like the 1541 and 1571, but it will have a bigger buffer (memory) area to allow for full track reads and writes (mostly responsible for the added speed).

The 1581 will respond to all of the DOS (Disk Operating System) commands of its predecessors plus some commands of its own. In short, anything that uses DOS for disk access should work fine. Copy protection will, as usual, complicate life and the new GEOS will have to be modified before it can be used, but the drive should be a real boost for CP/M users. Buyers of new systems will be tempted to skip the older drives in favor of the 1581, but remember, it will take some time before software vendors make their wares available on 3½" disks.

And More Memory

Now on the shelves for the 128 are the 1700 and 1750 RAM Expansion Modules. These cartridge units are about the size of the Commodore modems that you may have seen, but they plug into the cartridge port. They expand the internal storage capacity of the 128 by 128K and 512K respectively.

However, these modules do not add to the random-access memory. You cannot execute programs that are stored in them without first transferring the code into regular memory. And even BASIC 7.0 cannot use them directly for variables.

How do you use them? The engineers we talked to at Commodore kept referring to these units as 'RAM-disks', and that is exactly the way it makes sense to use them. Any time the computer needs temporary external storage, such as for a temporary file, the RAM Module comes into its own. It is supported with three 7.0 com-

mands: STASH (stores data in the RAM-disk), FETCH (retrieves data from the RAM-disk) and SWAP (exchanges data between the RAM-disk and memory). These are block moves, that is you must know (in decimal numbers) the starting address of both the origin and destination as well as the size of the area you wish moved. (Commodore is working on a DOS extension so that you may use more familiar disk commands — then it really *will* be a RAM-disk.)

The beauty of all this is the extreme speed at which it happens. Bil Herd, (at the time) Senior Hardware Design Engineer for the 128, told me that the transfer rate is one million bytes per second. That means that the largest possible transfer (128K) will happen in ¼ second.

The most immediate use, if you are not a programmer, is for the disk-intensive CP/M. The latest version of CP/M (one comes on disk with the expansion, if it didn't come with your computer) supports the RAM Module as a true RAM-disk. In addition to external disk drives A, B, etc., you have "drive" M. It is a treat to transfer the most used transient commands such as PIP to drive M and have them appear in the machine instantly when called. (More about this, too, next month.)

Exciting times

I sure hope that Commodore's move back to basics is good for them. I know it will be good for consumers. It's just great. All this nice stuff and more on the way make for exciting times.

■

Reflections on CBM's Direction

by Grant Johnson and Bob Lindstrom

It's funny how trouble brings you back to basics.

Take Commodore for example. Commodore has been managed throughout the explosive early years of the home computer market as though it were still a small business. Rapid changes in policy and personnel, when they work at all, only work in an organization where everybody gets the message at the same time. No one has ever done that with a billion-dollar business. Quick movements on the helm of the Queen Mary would hardly be felt at the other end of the linkage — let alone change the course of the ship.

Things can get out of hand quickly when the growth curve points all but straight up. Remember, the VIC-20 was introduced less than five years ago, and the Commodore 64, the best-selling computer in history, was introduced a couple of years after that. If reality hadn't exerted itself at some point, Commodore would have exceeded the gross national product in short order.

Stockbrokers have a term they use when the market is going down the toilet but they don't want to scare the customers: correction. Many companies ceased to exist during the recent "correction" in the computer industry.

Commodore survived, but is up to its eyeballs in concerned investment bankers. Trying to be a high-flying computer manufacturer with your every move inspected by a committee of bankers is about as much fun as learning to drive with your mother in the car. Of course, the best way to deal with hungry bankers is to shove a wad of money in their mouths the next time they open it to back seat drive. But where to get the money? Back to basics.

Basic fact: In an industry that changes nearly as fast as *Billboard*'s top ten, the 64 is still the fastest-selling computer on the market. Now, unless you want to join the other "corrected" companies of recent memory, you don't mess with success. Commodore tried that once ... there are currently hucksters on late night television making a profit liquidating the Plus/4 at 30 cents on the dollar.

The latest wave of new product introductions from Commodore might mean that the days of the Plus/4 and the new-computer-for-its-own-sake may be over at Commodore. The new products focus on the successes of the 64/128 and add new product support for the six million C-64 owners in the world. It's a lesson Apple learned when it put all its energies in the Macintosh, only to watch Apple II sales skyrocket.

The longterm effectiveness of Commodore's back-to-basics plan remains to be seen. If it can generate income to stuff between those bankers' lips, then the plan worked. If not, well, let's not think about that right now.

For the short term, however, owners of C-64's and buyers of the new 64C are getting reinforcement for their purchases. Commodore's new product line helps to reassure all 64/128 owners that the company intends to keep their machines up to date in the future. And that kind of message can only encourage obsolescence-wary prospective buyers to put their bucks in a Commodore computer.

■

More Computer Magic

Coinfusing Cards

by John Olsen

Magicians like to use regular everyday household items to produce their magical effects. They do this for a variety of reasons. These items are commonly available, which means that the magician can borrow them at his performance and need not carry them along with him. The items are familiar with everyone, so the audience is unlikely to become suspicious of them (unlike stage props which could be "rigged"). But probably more than anything else, the use of everyday objects enhances the magic.

If cups and saucers start to float in the air, it is much more mystifying than a silver ball. After all, you have used the cups and saucers before, and you know they don't float. You haven't seen the silver ball, and are not as sure about its qualities.

The mark of a good magic trick is not only how well it astounds and confounds, but also whether it can be repeated without giving the secret away. I have seen some tricks which were terrific the first time. But upon seeing it the second time, the secret was obvious. For example, when the magician "accidentally" drops the coin during each performance, it's rapidly apparent that it was no accident. And when you examine this seemingly irrelevant act, you now notice him sliding the coin under his shoe. Or perhaps, in watching a mental act for the third time, you notice that the words the blindfolded mentalist speaks to his assistant are exactly the same. It doesn't take long to figure out the phrase "what is this item?" is a code for "wristwatch".

So, a good magic trick must be repeatable. And it must be puzzling. And if it uses common everyday objects, it puts the audience just that more at ease and makes the trick appear even more magical. All of these things are woven into the trick I call **Coinfusing Cards.**

This magic trick uses common items found in nearly every household. It requires a deck of cards (which most homes contain), some pocket change (which most of us have, even though we would like more), and a computer (which more and more people are buying). And yet, for its simplicity, this trick supplies a most puzzling and suprising effect. The computer asks you to mix three cards and three coins, then pick one pair. It will then, without fail, tell you exactly which ones you were thinking of.

The effect is as follows. The computer asks you to place three playing cards face up in front of you. You are told they can be put in any order. Then the computer directs you to place a penny, nickel, and dime on the cards. Again, you have free choice of which coin to put on which card. The computer then asks you to trade the places of a few cards and a few coins. For example: "Trade the Ace with the card to its left." And if there is no card to the left of the Ace, you don't do anything. The computer can then tell you which card and coin are in the center pile (or left, or right).

From reading this description, it may not be apparent how impossible this really is. But this trick is a real stumper! You have free choice when laying down the cards and the coins. Sometimes the computer has you move both the cards and the coins on them. Other times, it has you move only the coins. Sometimes it names a card by name ("move the FIVE to the right"), but other times, it only names places ("trade the center and the right cards"). It *never* specifically tells you where to put *any* card (it never tells you to "put the NINE in the center"). The cards are thoroughly mixed, yet the computer unfailingly can divine the location of the cards and coins.

A vital point of this trick is that it can be repeated without giving away the secret. You can sit in front of your computer with three cards and three coins for hours playing this magic trick. Each time you mix the cards and coins at random. But the computer unerringly finds the position of the cards and coins — *every time*. The directions are always different. The final positions are always different. There is no clue to how this mystery is accomplished. And it is this that makes the effect so strong.

But, as with all magic tricks, the real secret is not difficult to understand. All it takes, is someone to show you how it can be done. When you know the secret, the lustre of the magic spell is broken, and you feel let down. You feel that, "gee, I could have figured that out . . . " But, of course, the fact is that you didn't. You had to be told. The heart of magic is that the trick is never explained, thus maintaining the beauty and magic of the illusion.

In a way, I hate to explain this trick because I know it will spoil the mystery. But from a programming standpoint, it is necessary to explain the secret in

order to explain the method of programming. If you are not interested in the details of the program listing, this is the time to start typing it into your computer. When finished, you can run the program and amaze your friends and family with one of the best computerized magic tricks ever created.

But for those of you who want to learn more about BASIC programming, or just want to learn how the trick works, the secret of this mental effect is about to be revealed ... As usual, the secret is really quite simple. Much of the remaining part of this article will explain how to take the simple heart of the trick and change it into a masterful mental mystery. This will be done by combining the secret with itself twice, and adding misdirections.

It is a simple mathematical fact that if you have three objects, there are six possible ways to set them in a row. If, for example, we have three blocks (numbered #1, #2, and #3) they could be set out in only one of six possible ways. These ways are shown below:

#1	#2	#3
#1	#3	#2
#2	#1	#3
#2	#3	#1
#3	#1	#2
#3	#2	#1

I can now show you that I can move box #3 to the front of the row (to the left side) in only three swaps. And it doesn't matter which of the six possible ways the boxes are arranged to start with. First, swap box #2 with the box to its right. Second, swap box #3 with the box to its left. And third, swap box #1 with the box to its right. If at any time there is no other box to swap with, no swap is to take place.

It doesn't matter which of the six possible arrangements is used. These three steps will always force box #3 to the left side. The chart in **Figure 1.** illustrates this fact.

As you can see, box #3 is always on the left after the three moves. By following these three steps, you can "force" box #3 into the left-most position. And this is the whole secret to the mental trick.

Now, if we replace the three numbered boxes with playing cards, the first part of the trick becomes obvious. Replace box #1 with the Ace of Heart, box #2 with the Five of Spades, and box #3 with the Nine of Diamonds. If you have a person lay down these three cards in any order, then give him the directions listed above, you will know, when he is done, that the Nine of Diamonds will be on the left.

But in this simple form, the trick would be obvious after several tries. If each time you asked your friend to think of the card on the left, he ended up thinking of the same card, it would soon be apparent that you were "forcing" this card. No matter which way he started, you always asked for the left card. And it was always the Nine of Diamonds.

Some misdirection can help veil the obvious. Perhaps you could add a fourth or fifth step. Since you know the exact location of the Nine of Diamonds after the third move, all successive moves could capitalize on this fact. For example, the fourth move might be to swap the center and left cards. Only you know that the Nine of Diamonds is now in the center. Or you could swap it to any other position, keeping track of its final location. This would make the trick harder to figure out.

The weakness here is that you always end up finding the same card. Your friend will notice the obvious here; the card you divine is always the Nine of Diamonds. This could be avoided by replacing the three boxes with which we started, with different cards. We still use the same three cards, but assign them to different boxes. For example, the second time you show the trick, you might mentally remember that box #3 will be replaced by the Five of Spades (not the Nine of Diamonds). So after the third move, the Five of Spades will be on the left side. Now add a fourth step to confuse things further and then announce the card to be the Five of Spades.

You could also try trading directions. Instead of saying "left", you could say "right". Keep track of

Starting Position	Move #2 Right	Move #3 Left	Move #1 Right
#1 #2 #3	#1 #3 #2	#3 #1 #2	#3 #2 #1
#1 #3 #2	#1 #3 #2	#3 #1 #2	#3 #2 #1
#2 #1 #3	#1 #2 #3	#1 #3 #2	#3 #1 #2
#2 #3 #1	#3 #2 #1	#3 #2 #1	#3 #2 #1
#3 #1 #2	#3 #1 #2	#3 #1 #2	#3 #2 #1
#3 #2 #1	#3 #1 #2	#3 #1 #2	#3 #2 #1

Figure 1.

this in your mind as you give the directions. Just give the directions backwards. Then after the third step, you know that box #3 (or whatever card you have chosen to replace it) will be on the right end, not the left end. This bit of misdirection will add to the confusion even further.

Now the trick is not only getting harder to pierce by your audience, it is also getting harder to perform. You must mentally keep track of which card replaces which box. And you must mentally keep track of whether you are using the original directions (right, left, right) or the reverse directions (left, right, left). For a human, this can be difficult at best. But for a computer, it is a very simple matter to keep track of this information. And that's why I created this trick for the computer to perform.

But, there's more! We can add a second layer of objects to make the trick even harder! On top of each card, we place a coin. Then the coins are also mixed up. And when you are done, you can not only tell your audience which card they have chosen, you can also tell them the value of the coin. This is really easier than it appears. You must give directions for six moves; three moves to get the cards in the proper place and three more moves to get the coins in the proper place.

You start by mentally choosing which card will replace box #3 and eventually end up on the left end. Also mentally pick which coin will eventually end up on the left end. Then you give the same three moves as originally described. Tell your audience to move the coins along with the cards. After the three moves, your chosen card will be on the left of the row. The coins will be totally mixed up, but that doesn't matter since the next three moves will force it to the left end. Now give the same three moves as originally described, but be sure your audience moves only the coins, not the cards.

At the end of the six moves, you know which card and which coin are on the left end of the row. You can now add one or two more moves to confuse things further (but hopefully not confuse you). If you replace box #3 with a different card and a different coin each time you show the trick, and if you swap directions as explained above, the trick is impossible to explain! Keeping track of all this information if difficult for a human, but this is where the computer excells! And that is what makes this such a perfect trick for the computer to perform.

So, when the computer performs this trick, it randomly mixes up the cards and coins, so a different one will end up on the end after the three moves. The computer also randomly mixes the directions, and remembers which end of the row the chosen card and coin will appear. Then it asks you to take the six steps required to bring the card and coin to the end of the row. It adds a seventh step, randomly either leaving the chosen card and coin on the end and swapping the two other cards, or swapping the center one with the chosen one. In this way, the chosen card can be made to appear in the center as well as on either end. The last step, of course, is to reveal the card and coin after an appropriate (and flashy) delay.

We will now look at the program itself, and see how it accomplishes all of this. The mixed cards and coins are placed in a two dimensional array named C$. The directions are mixed and placed in the D$ array. All this is done in line 10. Line 20 sets up the colors, and line 30 sets the print into the upper case/graphics mode, locks it there, and clears the screen. Lines 50–80 read the names of the cards and coins, mix them up, and put them in the C$ array. Line 100 decides whether the "left/right" directions will be normal or swapped. Line 110 picks which end of the row will contain the chosen card and coin.

The first screen is displayed in lines 120–310. Then the program goes to the subroutine at line 690. This subroutine waits until the RETURN key is pressed. Then it changes the screen color (read in from data statements), clears the screen, moves the cursor down a bit, and returns to the main program.

The next part of the program tells the audience to make the six moves necessary to place the chosen card and coin at the desired end of the row. This is done is a FOR/NEXT loop between lines 330–430. Two nested loops handle the three moves for the cards and the three moved for the coins. Basically, the same thing is printed each time, with only the name of the card or coin being different. The variable C is set up in line 330 and toggles back and forth between 0 and 1 in line 410. The purpose of C is to toggle between "left" and "right" when giving the directions. Finding the length of the string variable in line 340 is for the purpose of centering line 350 on the screen.

The next segment of the program prints out one further step for the audience to follow. This step makes it possible for the chosen card and coin to appear in the center as well as one of the ends. In line 440, a random number from zero to two is chosen. In one chance out of three, the chosen card and coin will be forced into the middle. Either the chosen combination will be swapped with the center, or the wrong end will be swapped with the center. Line 450 chooses which will occur.

Lines 440 and 450 flash the screen colors to give the illusion of many computations taking place, even though the correct answer has been known from the beginning. Then the correct card and correct coin are revealed in lines 560-670. The computer waits for a key press in line 680 and then reruns the program.

If you decide to try your hand at designing your own computerized magic trick, start with a simple premise. A unique little mathematical curiosity is always a good way to start. That's what was done

with COINFUSING CARDS. Then work away from the heart of the trick by replacing the obvious (for example, the numbers) with the less obvious (for example, coins or cards). Add some misdirection (extra steps) and some twists (use the basic trick twice) and you will have a good trick. Give the trick a variety of random factors that a computer can easily keep track of, and you will have a great trick! Give it a try. I wish you luck.

■

Coinfusing Cards Listing

by John Olsen

```
1 rem * * * * * * * * * * * * * * * * *
2 rem *                               *
3 rem *    (c) 1986  john olsen       *
4 rem *                               *
5 rem * * * * * * * * * * * * * * * * *
10 dimc$(1,2),b$(1),d$(1)
20 poke53280,0:poke53281,5
30 printchr$(142)chr$(8)chr$(147)
40 b$(0)="card":b$(1)="coin"
50 fora=0to1:forb=0to2:r=int(rnd(0)*3)
60 ifc$(a,r)=""thenreadc$(a,r):nextb,a:g
oto100
70 r=r+1:ifr>2thenr=0
80 goto60
90 data"[blu]5[blk]A","[blu]9[brn]Z","[b
lu]a[brn]S","[yel]nickel","[yel]dime","[
yel]penny"
100 r=int(rnd(0)*2):d$(r)="right":d$(1-r
)="left"
110 r=int(rnd(0)*2)
120 printtab(12)"[blk][16 cmdr-p]"
130 printtab(11)"[cmdr-n][brn][rvs on]co
infusing cards[rvs off][blk][cmdr-h]"
140 printtab(12)"[16 cmdr-y]"
150 printtab(13)"by  john olsen"
160 print"[2 dwn][6 spc]you will need th
e following"
170 print"[9 spc]three cards and coins:"
180 print"[2 dwn][wht]  U[5 shift-*]I  U
[5 shift-*]I  U[5 shift-*]I"
190 print"  B[blu]a[brn]S[wht][3 spc]B
B[blu]5[blk]A[wht][3 spc]B  B[blu]9[brn]
Z[wht][3 spc]B[3 spc][yel]penny[wht]
200 print"  B[5 spc]B  B[5 spc]B  B[5 sp
c]B"
210 print"  B[5 spc]B  B[5 spc]B  B[5 sp
c]B[4 spc][yel]nickel[wht]"
220 print"  B[5 spc]B  B[5 spc]B  B[5 sp
c]B"
230 print"  B[5 spc]B  B[5 spc]B  B[5 sp
c]B[7 spc][yel]dime[wht]"
240 print"  J[5 shift-*]K  J[5 shift-*]K
  J[5 shift-*]K"
250 print"[3 dwn][blk][3 spc]when you ha
ve all six items before"
260 print"[4 spc]you, ";:gosub700
270 printtab(4)"lay the cards face up in
 a row"
280 printtab(3)"in front of you.  put th
em in any"
290 printtab(13)"order you wish.[2 dwn]"
300 printtab(4)"lay one coin on each car
d.  put"
310 printtab(4)"the coins in any order y
ou wish."
320 gosub690
330 fora=0to1:c=r:forb=0to2
340 l=len(c$(a,b))/2
350 printtab(11-l)"trade the "c$(a,b)"[b
lk] with the"
360 printtab(11)b$(a)" to its "d$(c)"."
370 ifa=0thenprinttab(8)"[dwn](move the
coin with it)"
380 ifa=1thenprinttab(9)"[dwn](don't mov
e the card)"
390 printtab(3)"[dwn]if it's already on
the "d$(c)" side"
400 printtab(5)"don't trade it with anyt
hing."
410 c=1-c
420 gosub690
430 nextb,a
440 s=int(rnd(0)*3)
450 a$=d$(r):ifs=0thena$=d$(1-r)
460 printtab(6)"[3 dwn]trade the card in
 the center"
470 printtab(8)"with the one on the "a$"
."
480 printtab(8)"[dwn](move the coin with
 it)"
490 gosub690
500 printtab(7)"[3 dwn]think of the card
 and coin"
510 ifs=0thenprinttab(13)"in the center.
":goto530
520 printtab(14)"on the "d$(1-r)"."
530 gosub690
540 print"[5 dwn]"tab(14)"concentrate"
550 forx=0to213:poke53281,xand15:next
560 print"[clr][5 dwn]"
570 printtab(10)"you were thinking of:"
580 printtab(16)"[3 dwn][wht]U[6 shift-*
]I"
590 printtab(16)"B"c$(0,1)"[wht][4 spc]B"
600 printtab(16)"B[6 spc]B"
610 printtab(16)"B[6 spc]B"
620 a$=c$(1,1):ifa$="[yel]dime"thena$="
"+a$
630 a$=left$(a$+"  ",7)
640 printtab(16)"B"a$"[wht]B"
650 printtab(16)"B[6 spc]B"
660 printtab(16)"B[6 spc]B"
670 printtab(16)"J[6 shift-*]K"
680 wait197,64:wait197,64,255:run
690 printtab(6)"[4 dwn]";
700 print"press <return> to continue.":p
oke198,0
710 geta$:ifa$<>chr$(13)then710
720 readx:print"[clr][6 dwn]":poke53281,
x:return
730 data6,7,10,3,4,14,9,13,8,5
```

Classic Board Game Inspires EA's New Lords of Conquest

by Randy Chase

Remember **Risk**? That delightfully addicting war game from Parker Brothers. The one that obsessively engulfed entire weekends, increased manyfold the household tensions, and sparked sibling feuds that are still smoldering in the background? It's most likely still there in the top of the hallway closet with all those other board games that were retired and forgotten when you brought your computer home. Well, guess what? Just like Norman Bates, it's back again.

It's called **Lords of Conquest**, from Electronic Arts, and in fairness, it is not the Parker Brother classic. But the similarities are far more than casual. While the basic concepts are going to be very familar, it very quickly becomes apparant that **Lords of Conquest** expands upon both the premises and the scope of **Risk**.

For those uninitiated in the strategic subtleties of **Risk**, it's a board game that evolves around strategic placement of military tokens. The goal is the same as that of **Lords of Conquest**: to eliminate your opponents in your campaign for global conquest. Granted, its not a game for the meek and timid; but perhaps the real key to the long-term success of **Risk** was that it was a game that evolved around sound strategy more than luck. While it did use dice to determine the results of conflicts, in the long run, the better player would almost always win.

Lords of Conquest takes that old familiar format and not only computerizes it, but takes it into the 80's with many nuances and subtleties that just weren't possible in the day of the board game. **Lords of Conquest** includes 20 different maps, not just a single game board. Alexander the Great cried when he discovered that he had no more worlds to conquer. That will never happen with Lords as it includes an editor to customize the existing maps and create new worlds, as well as an option for random generation of maps.

Unlike Risk which focused strictly on control of continents, Lords evolves more realistically around control and possession of natural resources. Players plot and plan to either gain or hold control of grazing grounds, gold, iron, coal, and forests. Each has its own value and purpose, and sucess will usually come to the first player to control several resources, provided that he uses those resources wisely in the development stage of the game.

Play of Lords is handled in yearly phases. During set-up, options are offered for resuming a saved game, choosing an existing map or creating a new one, and for four levels of play with increased complexity. While it accommodates four players, a computer oppenent is also provided, with nine levels of skill. The computer is beatable, but it does have a decided advantage in that it *always* knows the exact strength ratio between *all* of the territories while the human player is handicapped in his need to stop and think about such details.

There are even three choices for the role you want luck to play in determining the outcome of conflicts. At the lowest level, the vastly superior force will always prevail, and at the highest level of luck, anyone has at least a remote possiblity of winning a given conflict. Even at this level, though, Lords remains a game that is going to consistantly reward the superior strategist.

Once all preliminary choices have made, player take turns selecting their initial parcels of land. Between very evenly matched players, many games will be won or lost at this point, much like chess games between Grandmasters are often determined in the opening sequences. Like a an unfolding chess game, however, even a vastly superior opening position can be squandered away through incompetance or impatience.

A year of action begins with a development period for utilizing resources that have been produced in previous turns. Depending on the resources at their disposal and the level of game they are playing, players can develop weapons, boats, and cities. Winning the game is accomplished by successfully developing a pre-selected number of cities (from three to six) and then retaining control over them until the end of that yearly cycle. In case two or more players end that turn with the required number of cities, play will continue in one year increments until one player has a greater number of cities under his control.

The crux of Lords of Conquest, however, is in the Attack Phase. While the game is actually won in the phases leading up to the actual conflict, it is here that the

spoils of war are divided between the superior forces. Conflicts are actually resolved by a very simple process. Force points for every territority on the map are determined by a combination of adjacent friendly terrirories, and cities, weapons, horses and boats in both the territory itself nd those adjoining it. It's a simple mathematical process, for the computer at least. There is a useful scouting report available that shows you the status of any territory.

In multiple player games, however, this simple balance of power gets somewhat more complex in that an attack on a territory must also take into consideration any adjoining third parties, who have the option of remaining nuetral or siding with either of the opposing parties. In any given yearly cycle it is not only possible, but often advantageous, to switch your supporting loyalties from one player to another. While such actions may not win you friends, it may make the difference in a very close and evenly matched game.

Lords of Conquest is not only a very captivating game for those looking for a challenge, but with the incredible versatility of the map editor and designer, it should prove to have long-term playing appeal. Every new map created offers a whole new world calling for its own unique strategies. In a game using, for instance, the North American map, boats are of a much lesser importance than horses. In a world designed around islands, however, a vital key will be possesion of ships, which can only be developed with either Timber or Gold.

I found that once I had mastered the playing of the game, which takes only a game or two, the 20 maps provided were disappointing and began exploring both my own modifications of the existing map library as well as designing a number of new worlds. Once you create a world and play it once or twice, it's easily modified. Only after playing a few games with a new map will the relationship of the designed territories become apparent. I found that I wasn't usually pleased with a new map until I had played it several times, and had made subsequent modifications.

In conclusion, this just may be the best multiple-player game yet offered for your Commodore. And, like its predecessor, Risk, it should have both the long-term appeal that transforms a contender to a classic and the subtleties that will offer a multitude of opportunities for testing the strength of friendships when the conquest of the world is at stake.

A Few Playing Tips . . .

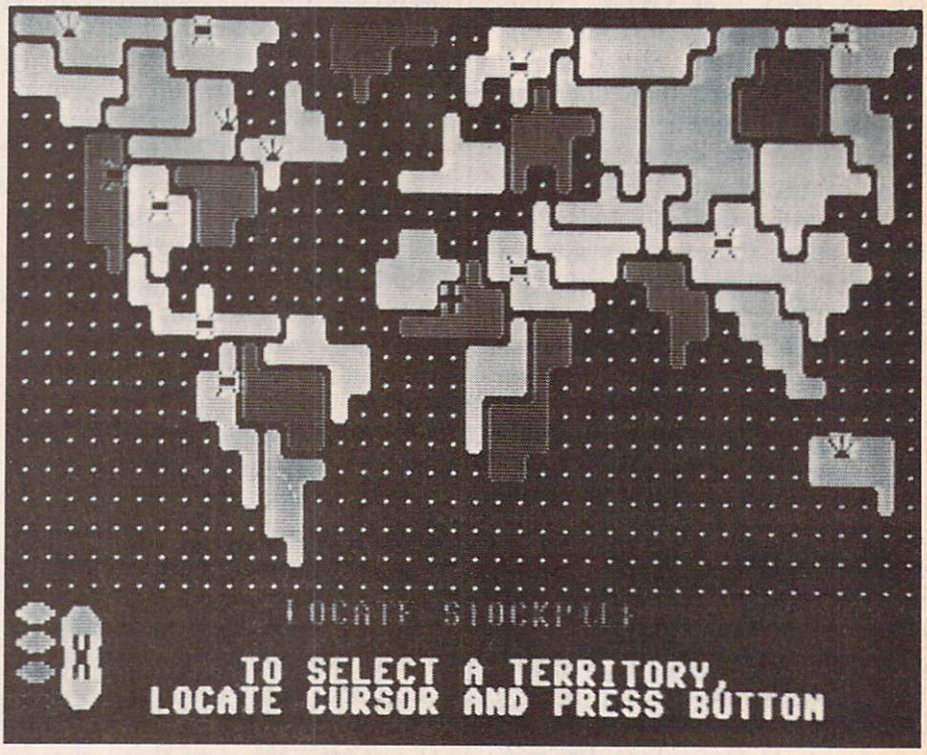
When initially selecting territories, the combination of a gold resource and a pasture to produce horses will most frequently give you an early jump both in developing weapons and in using them most effectively.

Most maps feature a couple of *key* territories that can prove vital in defending an area. Look for territories that are bordered by an exceptionally high number of others. These are more easily defended, and as a location for either a weapon or a city, will give the maximum amount of impact of that strength.

When making decisions, keep in mind the order of play (which alternates each turn). Be aware of who may be attacking you after you've shifted your forces for an assault. It's easy to be too aggressive and, in turn, leave yourself vulnerable.

When choosing the placement of a city, don't overlook the possibility of having it adjacent to *two* resources, as any resource touching a city will double the city's production. A city that doubles production (and defends) two or three resource-producing areas is a decided advantage.

Always protect your stockpile. An opponent may ad-

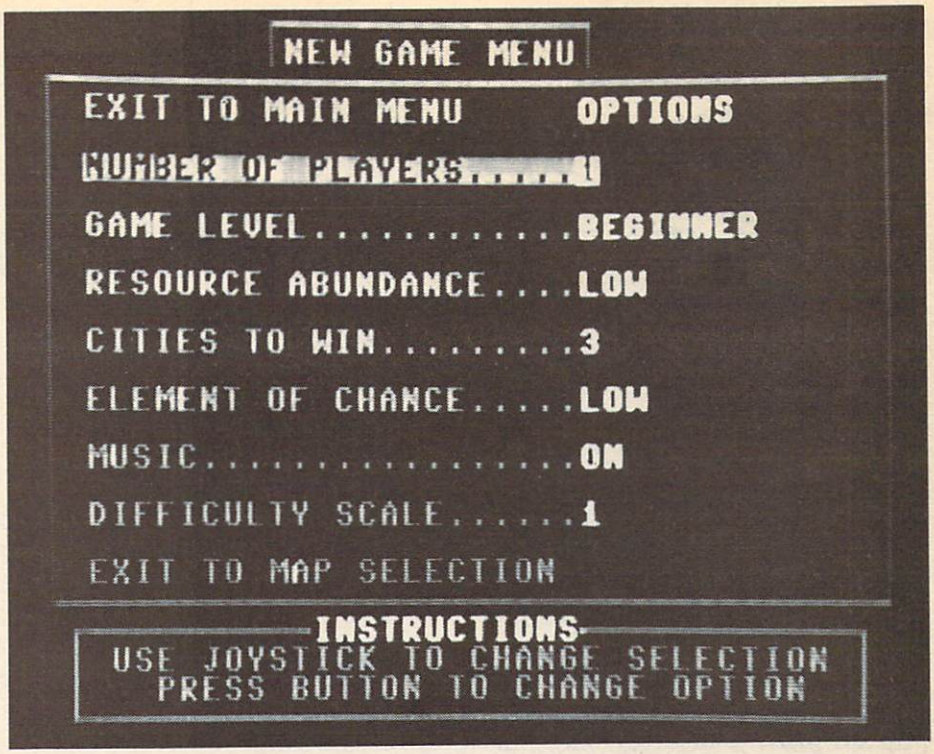


World map with territories marked out in four colors (four players). Cursor is moved with joystick; selection made with fire button.

vance through two territories in an attacking phase; you should always try to keep an adequate buffer of protection around your stockpiled resources. A captured stockpile awaiting the next development phase will frequently prove to be the turning point in a game.

When considering the possiblity of allying yourself with another player attempting to capture someone else's stockpile, remember that if he decides *not* to trade you your share of the spoils, there's little you can do short of hoping to capture his stockpile in return. Allies are fleeting in nature, and there is no way to enforce verbal promises.

In staging an attack, it's best not to move a weapon into a space inhabited by an opponent's weapon. Upon resoultion of the conflict, only one weapon will remain in the space. If you win, you lose the advantage of capturing your opponents weapon.



Menu for Lords of Conquest. You can set it for up to four players. Bottom selection leads to another menu for selecting maps.

Paperback Writer 128/64
Easy Way to Best-Seller List

by Grant Johnson

Word processors have become a staple for the home computer owner, and there are a wide range of programs on the market. At one extreme are the heavy-weight processors such as **PaperClip** and **Superscript**. These "full-featured" word processors will do just about everything but type in the words themselves — provided you know how to use them. At the other extreme are the cute, clutzy and even incompetant light-weights.

Arrayed between these extremes are any number of products for processing words. With such a wide range of good and well-established word processors, you just wouldn't think there would be much room for another successful product.

Yet **Paperback Writer** from Digital Solutions Inc. has found a place for itself in both software stores and users homes. It is nice to know that it's still possible for a couple of people, Vic Kass and David Foster to get together and sucessfully market a good product. These fellows went from zero to over a hundred thousand products shipped in little over a year. Like most "overnight" successes, they had paid their dues, most recently at Richvale Software. They have made very impressive progress in a tough market. And you don't do that with Edsels.

Judging by the cover

A quick look at Paperback's cover tells you that "You can be up and running in less than 30 minutes, even if it is your first time in front of a computer." This statement is more plausible with the auto-loading 128 version. It is clear that ease of use is a top priority. After a welcome fast-load, Paperback greets you with extensive menus and help screens.

What you see

"What you see is what you get", says Paperback's cover, and that is largely true.

With most word processors for the 128 and 64, the two fundamental processes of entering/editing text and viewing/printing text are distinct. In fact, you can enter your entire text with no thought whatever to its final appearance.

In practice it is rarely done that way. Paragraphs are usually indented and ended. Boldface, italics, underlining, superscripts and subscripts are indicated as the text is composed — if only because such things are integral with the text's meaning. Features like italics typically are indicated with the use of special characters or commands embedded in the text. The special characters are never printed, but are translated into codes that effect how the text around them is printed. However, these special characters and codes can add up to a Chinese screen that would scare any first-time user.

Italics, boldface and underlining are done differently in Paperback. You simply tell the processor that you want italics, and the text itself appears on the screen in *italics*. Underlined text is underlined, and boldface appears in a contrasting color that clearly indicates the intended emphasis.

The important thing is that this text enhancement is visible during the entry phase. Most of the better word processors will print to screen what the output will look like, but that requires special commands — all editing must be suspended while you're looking. On this point, Paperback's convenience is self-evident.

Getting what you don't see

#Seeing underlines and boldface for what they are right on the screen makes immediate sense, but what about other possibilities such as different pitches (number of characters per inch)? Making such things appear on the screen requires that the program use several sets of fonts that do not come with the machine.

Well-written code is one thing; magic is another. A character set requires more than 500 bytes. Multiply that by the number of pitches, double it again to add italics and there is soon little memory left for anything *but* fonts!

As a solution, Paperback has a text formatting mode. When ac-

tivated, the top half of the screen displays a menu including pitch and margin control commands. The lower half of the screen is divided vertically with the left edge of the text you have been working slipped to the right side of the screen. The new left side of the screen below the menu is reserved for a sort of listing of special effects. It is as though you were writing down, in the left margin of your manuscript, instructions on how the lines are to be printed.

It sounds more confusing than it is. Say you want to change the pitch to 5 CPI in order to print a title in double-width characters. Pressing the **f5** key brings up the formatting menu. Select "Pitch" and the word appears in the left-hand portion of the lower half of the screen, beside the text to which it applies. Enter the number 5 (for 5 CPI) and return to the normal editing mode.

Up to 14 formatting commands can be attached to each line, and, when your edit cursor is on that line, they are all spelled out in the format command window. Now, instead of cryptic codes salted throughout your text, you have commands that are visible only in the formatting mode. Further, when that code is visible, its meaning can be seen in English.

Of course, the commands' effects are visible on the text in edit mode. If you want a date to print against the right margin, you would specify "Right align" in the format window. When you return to the edit mode, the date will appear right justified on the screen. As an added convenience, Paperback puts a checkmark in the status line when the edit cursor is on a line that contains formatting information.

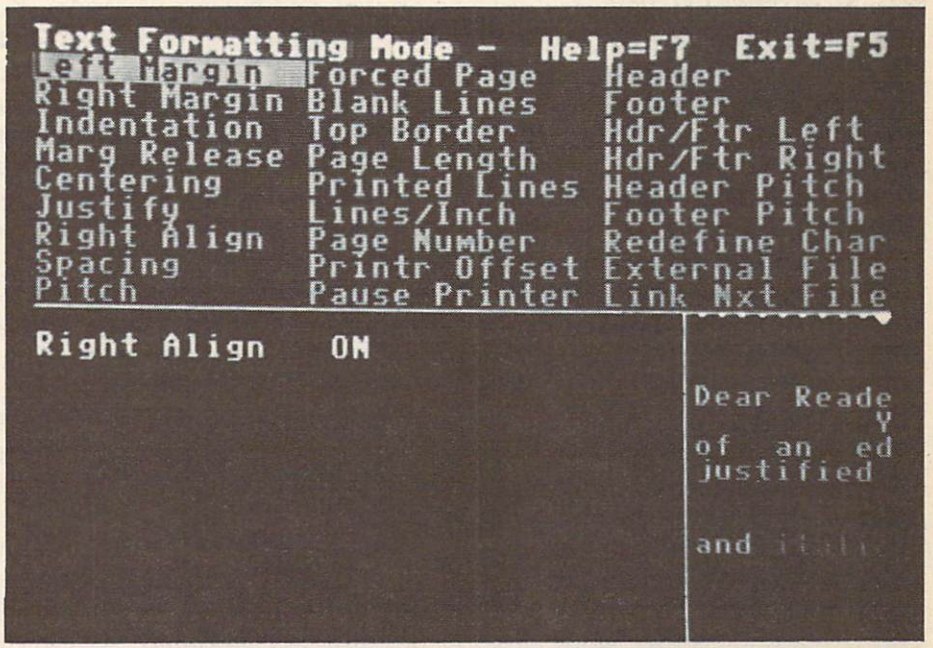
In the format mode, the cursor keys are used to pick out the "special effect" of your choice. This is convenient, but it means that you must place the cursor on the line you want to modify *before* you move to the format menu. I found it awkward to have to swap back to the edit mode to move to another line. Also note that the smallest entity that can be affected by these commands is a *line*.

If you must have double-width characters in the middle of a normal line, you will have to use the Redefine Character feature. This feature permits you to create up to ten special "characters" by assigning ASCII values to them. Each of these "characters" can hold multiple values, so, if you know how to speak escape codes to your printer, you can assign a whole sequence of them to each redefined character. Of course, you then must embed these cryptic characters in the text, and . . . well that's not in the spirit of Paperback Writer.

But, people rarely need to change such things as pitch in the middle of a line. The formatting mode concerns itself mostly with setting borders (top and side margins), headers and footers, and centering. The intent of the defineable characters is more to access printer characters that do not appear on the keyboard. In fact, the default definition for the characters is for the French alphabet, é, á etc. (Digital Solutions is a Canadian company).

By the columns

There are two major display modes for working with Paperback Writer. On startup, you are given a choice of 40- or 80-column operation. You will need a good monitor to use 80-column operation on the '64. If your monitor is up to the job, the 80-column mode is especially useful with the what-you-see-is-what-you-get way of life. Set the margins greater than the screen width, and Paperback will scroll the display about for you to see your whole document in whichever mode you choose. Remember, however, that part of the document will be out of view. Those with faulty short-term memory, like me, must stop what they are doing and buzz the cursor to the other side of the screen to find out if they meant to say "is" instead of "are". Most people will want to go back and set their



Format menu shows the options available to the user while the lower screen displays the effect of the chosen option.

margins after they are finished proofreading.

Eighty-column operation is expensive in terms of memory, and the chief limitation (other than that it seems to react more slowly to commands) is the size of the text buffer or work area.

You can link documents together by moving them out to the disk and even print or search through them as if they were all one piece, but two type-written pages is about all that you can hope to get into the machine at once. The approximate maximum for 40-column operation is five pages. On the 128, Paperback will handle about 20 pages all at once, or memory can be partitioned so that you may work with two smaller documents at once.

On the '64, if you run out of room in the 80-column mode you must not only save what you have been working on, but also must reload the program to return to 40 columns. Thank goodness for its fast load.

Other features

When you return to that load menu, you will find a third option for "Spelling Checker". There is an optional $14.95 dictionary disk with 32,000 words and room for another 8,000 of your own choosing. Paperback allows you to create your own dictionary disk from scratch, but if you are really going to use this feature, 15 bucks is cheap compared to the time needed to make your own. I could not get a dictionary disk in time for this review, but the small one I made seemed to work well, as far as it went.

Paperback Writer has a full complement of tabulation, search and replace, block movement and deletion, as well as the ability to do columnar arithmetic and some sorting. It is also willing to read both PRoGram and SEQential files from some other word processors, and can do a mailmerge for form letters.

Conclusion

The majority of people who use word processor programs do so only occasionally, and then just to produce a memo, letter or short school assignment. Intermittent use places a premium on ease of use. Even if you are willing to go to the work of learning the complex command structure of a high-powered processor, without regular use you will soon forget the details. Paperback Writer has a well-designed and relatively easy-to-remember command structure, and adds to this extensive menus and help screens. It is hard to forget a command's name when it is right on the screen in front of you, and you need only push a button to see a brief description of what it does.

The manual that comes with the program is clearly written, but it is just as clear that Paperback's designers hoped you wouldn't have to use it. There are no tutorials in the manual, just the added details that you might need to, say, customize a printer file. There are, however, numerous such files already on the disk to enable proper computer-to-printer communication for most popular printers without modification.

There is one final reason for Paperback's popularity. Price. The Commodore version lists for $39.95 and the 128 PC version for $49.95. The sample I picked off a retail shelf had two program disks in it — a sensible precaution for this copy-protected product.

Frankly, I am not a typical user when it comes to word processors. I go into withdrawal when I am deprived of my macro keys and shortcut commands — things that no casual user in their right mind would bother with. But I think I understand Paperback Writer's appeal. I would not hesitate to recommend it to a friend. For most home users, this product will likely do 100% of everything they ask. And you can't ask for more than 100%.

Aegis Draw —

Computer-aided Design Comes to the Amiga

by Bob Lindstrom

Even if you're not an architectural engineer, computer-aided design (CAD) can be an effective and powerful tool in daily life.

The summer is almost over and plans to build a toolshed still haven't been drawn. The boss appointed you to supervise the redesign of the office; he wants the layout and a critical path chart of the project by Monday. The local community theater has roped you into doing the lighting for their next production and the technical director wants a lighting plot in time for next week's opening.

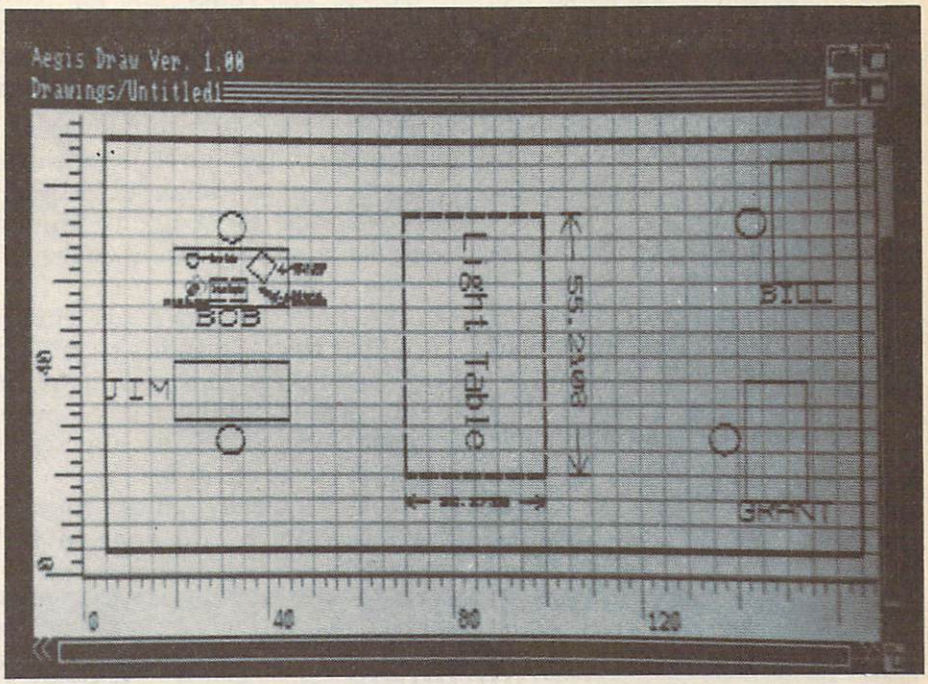
All of those grassroots tasks could benefit from computer-aided design. So just rush out and spend $5000-$10,000 for a microcomputer-based CAD system.

Right.

While CAD can be as useful in homes as a word processor, its prohibitive expense generally rules it out for any but professional situations.

But that is changing. The appearance a couple of years ago of MacDraw for Apple's Macintosh computer placed CAD within the financial reach of home computerists. If you could buy a Mac, you could afford to buy MacDraw. But considering the price of the Mac, you were still talking about a major home investment.

Aegis Draw, a $200 medium-level CAD system, for the less expensive (though, I admit, still pricey) Amiga computer makes CAD even more useful and affordable for home or small business.



Aegis Draw can easily be used to draw an office layout using the grid and ruler as guides.

For the budget-conscious (without need of printed copies of their work) Aegis Draw can be used on a basic 512K Amiga system with color monitor; or, as recommended by Aegis, with a memory-expanded Amiga (a nice 2 megabyte board, maybe), external disk drive, 20 megabyte hard disk, high quality RGB analog monitor (they suggest the Sony VK1311CR) and a plotter. Even with all those additions, Amiga and Amiga Draw cost a few thousand dollars less than most professional CAD systems.

Aegis Draw operates in the 640×200 medium-resolution of the Amiga. Making full use of the Amiga's pulldown menus and windows, Aegis Draw presents the user with a window framed by rulers and sporting a sizeable drawing grid. Newcomers can use rulers and grids to insure that their drawings remain accurately proportioned. Experienced draftsmen can do away with both by using pulldown menu commands and activating Grid Snap to automatically click their lines into each grid point.

Drawing is as easy as selecting and placing any one of several

graphics primitives (CAD language for shapes) from the pulldown menu. Among the available shapes are circles, rectangles, polygons, triangles, "rubber band" lines or arcs. Text can be entered anywhere on the drawing or, if a customized pattern is needed, the user can draw freehand (a memory-hungry option on any CAD system).

Once placed on the screen, the graphics can be manipulated in several ways. The shapes can be dragged to new locations, sized to scale, rotated 360 degrees, changed to any one of 16 colors (with the pallette under total user control), or copied anywhere on the screen.

Furthermore, the primitives and the grid may be drawn in nine different line patterns, three line thicknesses, and filled with one of eight patterns.

The mixtures of colors, line patterns and fill patterns can make even the most complex drawing easy to understand. If more clarity is wanted, however, the drawing can be divided among as many as 250 layers, any combination of which can be displayed on the screen.

Think of the layers as transparent overlays inside the computer. In an office layout, for instance, layer one could contain the desks, layer two the computers, layer three the lighting fixtures and layer four the wiring diagram. For the furniture movers, you could print out layer one's furniture plot. For the electrician, print out the lighting and wiring of layers three and four; and give the boss a comprehensive copy of all four layers on a single page. To distinguish between layers, each layer could be printed in one or more different colors using a color plotter.

#As impressive as Aegis Draw's colored layers, graphics primitives and grid/ruler tools are, its most remarkable ability (the most remarkable ability of any CAD system) is its zoom feature.

Theoretically, all drawings in a CAD system are done to full scale, that is, life-size. The user decides how much of the complete drawing will appear on screen at any one time. Therefore, it is possible to zoom out and view the entire drawing as if from a distance or to zoom in on the tiniest detail.

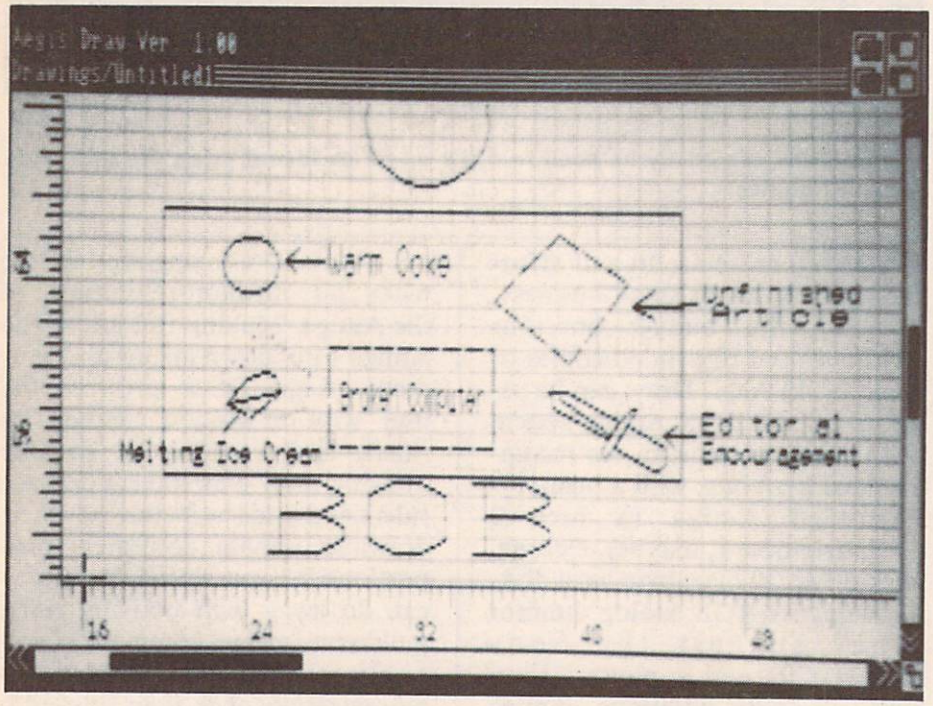
For instance, an office drawing could depict the entire floor plan in one view and zoom in to an individual pencil in another. With the Amiga's windows and Aegis Draw it is possible to have both views on screen at the same time, each in its own window.

Unlike computer sketching programs that store screen pictures, the plans of Aegis Draw are stored as data points and line manipulations. Those data files may be as intricate and detail-packed or as elementary as desired. The more work the draftsman is willing to do, the more detail the Aegis Draw "blueprint" can contain.

Along with the power of zoom, however, goes the most bothersome liability of a CAD system. Because the program recalculates its data instructions everytime the image is changed, any change in perspective takes time to generate. In short, a lot of time spent using a CAD system is spent waiting for the next view to be calculated.

It is here that Aegis Draw shines, at least for a software/hardware combination in its price range. Zooms and other recalculations in Aegis Draw run considerably faster than similar functions running on a plain vanilla IBM-PC or, in some cases, even on a PC clone with a fast processor. Aegis Draw still makes you wait, but the wait is tolerable.

Even at that, the speed of Aegis Draw lags somewhat behind a supercharged IBM-PC with elaborate graphics boards and processing speed boosters. However, with that kind of brute force computer system, we're talking about equipment costing five



Zooming in on an area of the drawing reveals details not visible in wider angle views.

to ten times the Amiga and Aegis Draw. You pays your money and you takes your choice.

Although Aegis Draw will do graphics dumps to dot-matrix printers supported by the Amiga system software, the program screams for the high-quality output of a plotter. Aegis Draw supports most popular plotters from Houston Instruments, Hewlett Packard, Roland and several others. It is also possible for an experienced plotter user to customize a driver that will print out the standard ASCII data files created by Aegis Draw.

Aegis Draw has many more features than those outlined here and will support such future Amiga developments as the Amiga Live! digitizer and the Genlock video-computer image mixer.

All of them are discussed in the well-written owners' manual provided with the program. The authors have recognized that Aegis Draw will provide an introduction to CAD for many Amiga owners and have written the manual accordingly. There's a tutorial that slowly guides beginners through basic CAD concepts and the capabilities of the program itself. Veteran CAD specialists can take a brisk glance through an appendix of commands and get started right away.

There is one feature I would have liked to see as a sometime CAD user and that is the ability to establish a scale for the drawing and then see at any given time the scaled length of a line as it is being drawn. For beginners, that kind of explicit statistic makes much more sense than grid snaps and the like, even though it is not so useful for CAD specialists.

Like much of the first and second generation software appearing for the Amiga, Aegis Draw points tantalizingly toward the future of the machine instead of realizing its full-blown potential.

For $200, however, Aegis Draw offers Amiga owners many of the functions of a low to medium-level computer-aided design system at a bargain rate (particularly when you consider that software alone in this category typically sells for $1500 and up). Designers with more elaborate needs will be served and served well (judging from the pre-release specs) by Aegis Draw Pro, a full-featured professional CAD package to be sold for under $1000.

In the meantime, Aegis Draw supplies a versatile array of CAD features, a reasonable price and enough power to satisfy a large number of design needs. It also marks a watershed achievement in the Amiga's ongoing development as a productive and powerful personal computer.

Superbase *The Book*
A Guide to Database Applications

by Grant Johnson

When you consider how far the home computer field has come in the last few years, you can perhaps appreciate the true value of the following statement . . . this article is about a new *book* on the market. The book is about how to use **Superbase**, a programmable database marketed for use on the Commodore 64 (and, separately, for the 128). Why, I remember . . .

When I brought home my first Commodore 64, there was not a single software title for it. I loved it all the same, and, having earned a living as a programmer, I wasn't at all scared of owning an orphan machine. It was my very own computer. I saw in it wonderful potential. The state of my involvement was, well, I believe the condition is known as infatuation.

I learned three things in a hurry: that my little machine was very big inside, that there were no worthwhile manuals for the thing, and that, in the age of information, only a masochistic hermit writes all his own programs. Being neither a masochist nor a hermit, I began trading programs with other owners, and watching carefully for any new program releases.

As time went by, a flood of software arrived, a lot of it adapted from the Apple and other machines.

Still later, manufacturers began releasing software simultaneously for both Apple and Commodore machines. The main difference between the products was that the Commodore stuff often cost less.

We have nearly come full circle. Some of the programs being developed for the '64 are so good, that Apple owners are looking for versions that will run on *their* computers.

Ends of the telescope

One such program is **Superbase** by an English company called Precision Software. Any doubts about the usefulness of the '64 for serious jobs should have been laid to rest by Superbase. Here was a program that could create, organize and maintain databases with up to 15 files. It had high level commands with which you could manipulate whole disks of information. In addition to its ability to relate multiple files in complex ways, Superbase was programmable. Just about anything that a user could do at the keyboard could also be programmed into the system so that it was highly automated.

Simple, but . . .

Superbase was designed to be simple to use. The programming language was implemented as an enhancement to BASIC. But many found its ease an invitation to attempt the ambitious. A few weeks after publishing a feature review of Superbase, we began getting calls from people who, though not secure in the basics of BASIC, were in the midst of setting up inventory, accounting and billing systems for their businesses!

While Superbase could be used to keep track of recipes and stamps, people caught on quickly to the fact that it could also be used as an applications generator — a program that creates programs.

The manual was quite good as far as it went, but writing a comprehensive manual for a product that has as many applications as it has users is extraodinarily difficult. (Don't believe me? Try to write a complete manual for the pencil.)

The only sane approach is to tell the user about the features, sketch out how the features might be put together, and then leave him free to use the tool as he sees fit.

Technique

With over 100,000 users hacking away, Precision Software has now been asked a question or two regarding Superbase technique. In response they have published *Superbase: The Book* (Precision Books, $15.95, list). The author, Dr. Bruce Hunt, has produced 194 pages that address, in three parts, "Setting up a database", "The automated database" and "The programmed database".

Reading the book is like sitting down with an expert who answers, with background, many of the most-asked "How do I get it to do such-and-such?" questions.

Dr. Hunt, a founder of Precision, is candid about Superbase's shortcomings and is refreshingly straightforward on how to work

around them. Hunt has included lots of examples and, in addition, he explains not only the how, but also some of the *why*.

I appreciated the answers to "why". It is much more satifying to understand why than to just do things a certain way because experience shows that to work. It was also fun to discover that some of my roundabout techniques were sometimes the same way the "pros" did it.

The book can be read or used as a suplementary reference. I recommend it to anyone with big plans for Superbase, but I should caution you that it is a book of techniques. You will not find ready-to-use templates or any prepared applications that you can key in and use as you would a BASIC program. After reading this book, however, you may find yourself creating your own.

Oh . . . and, by the way, you can tell your Apple friends that Superbase is now available to run on their machines. But we were there first.

■

Mighty Mouse . . .
Not So Mighty After All?

by Mindy Skelton

For those of you who have been waiting eagerly for a mouse for your C-64 or C-128, I have some good news and some bad news. The good news is that, to paraphrase the old song, Mighty Mouse is here to save the day. The bad news is . . . it won't.

Seriously, Mighty Mouse is the first Commodore mouse I have had the opportunity to play with, and I am underwhelmed. Mighty Mouse is a smallish mouse about the size of the Macintosh mouse, and considerably smaller than the Amiga mouse. It has two small buttons (actually elongated ovals) and attaches to your Commodore through an adaptor which plugs into your joystick port. The directions specify that it be plugged into Port 1, but I found that at least with some software (such as **Doodle**) it only works in Port 2. Such inconsistencies are minor, however, in comparison to some of the other problems I found.

My suspicions were first aroused when I noticed there was no manufacturer's name anywhere on the box. Usually, if you make something, you'd like folks to know about it, but not here. There is, however, a small sticker saying who imported the thing; Contriver Co. of Fremont, CA. There is also a notice that this version of the mouse works with the Commodore and the Amstrad computer (the *what* computer?). Oh well, packaging and manufacturer anonimity are really small matters.

Another annoyance was the documentation. Now, I'll grant you that a mouse shouldn't need pages and pages of documentation, but I was surprised when I found the documentation consisted of one sheet of paper showing a schematic of how to attach the mouse to a C-64, and 6 lines of text. The other side of the sheet gave similarly in-depth information on how to attach the mouse to the Amstrad computer.

To give Mighty Mouse its due, it *is* easy to connect, and the schematic is clear. (It darned well better be!) Again, perhaps the documentation a small matter, and maybe I'm being fussy.

The major problem I found with this mouse was that it doesn't work very well. It is *slow*. I tried the mouse out with **Doodle**, **Music Construction**, **Easy Script** and **GEOS**. Mighty Mouse was mind-numbingly unresponsive. The amount of mouse motion necessary to generate a cursor movement on the screen made me wonder if my mouse had not been replaced by one of those little friction toys which you rev up and let fly across your floor. Unfortunately, this mouse never "lets fly".

On the plus side, this Mighty Mouse did work with the products it said it would work with, and it does come with a one-year warranty. Overall, however, I would advise you to wait for the next mouse.

Mindwheel — A Fascinating Fantasy

by Bill Wallan

Wandering through your own obscure memories can be difficult enough, but consider wandering through someone else's. Not only must you imagine what you would do to accomplish something, you must also imagine what others might have done, since you are wandering through someone else's storehouse of thoughts. The result is a surrealistic environment, a dreamlike world where common sense can no longer be a part of your reality.

Synapse and Broderbund have marketed an interesting game that would have you travelling through the minds of deceased persons on a quest to save society from certain doom. Sound incredible? Read on.

Mindwheel, an Electronic Novel™, is the story of your quest to save society from its own self-destruction. The game establishes that your goal is to obtain the The Wheel of Wisdom, the only thing in creativity capable of giving man hope for survival.

The game comes with two disks, one of which is double-sided, and a hardbound book. Included is a program you can use to make back-ups of the disks. The book is their protection scheme. In order to play the game, you must type a word from the book when prompted by the computer. In all the times I loaded and ran the game while preparing for this review, I was not asked for the same word twice. It, therefore, is impossible to play the game without access to a copy of the book.

Once you have delivered the correct access code, you find yourself lying on a table in a scientist's laboratory, with Doctor Virgil standing over you asking if you are ready to begin. With the help of Doctor Virgil, who developed the technique of mind travel, you journey telepathically through the minds of four deceased personalities searching for The Wheel of Wisdom. Once you find it, you must then escape from the minds and return to reality with The Wheel of Wisdom in tow to achieve your goal.

To give you an idea of what you will be up against, perhaps a description of the minds through which you travel is in order:

"Bobby Clemon, assassinated rock star, once called 'half John Lennon and half Janis Joplin.' This scandalous musician made the anthems of freedom and pleasure for a generation. Shot by an unknown attacker during an immense protest rally."

"The Generalissimo, dictator and war criminal. He was executed for crimes so horrible that it seemed for a time that such hatred and violence had vanished from the world. But, incredibly, this monstrous genius now has a considerable posthumous following."

"Doctor Eva Fein, 'the female Einstein' of the late Technological Age. Honored for earthshaking work on the nature of matter and energy. A schoolmate of the Generalissimo, she fled his regime, then developed the horrible weapon that defeated him — weapons that now threaten the obliteration of all life. Her deathbed message to the world supplied Bobby Clemon with the words of a peace song."

"The Poet, passionate many-minded genius of the Learning and Art era, he wrote the great War Trilogy of poetic dramas, which centuries after his death remain the glory of your planet's literature. He wrote the plays in hopes of making enough money to marry the young princess he was hired to tutor. Her father, discovering the romance, had the Poet put to death in the Royal Dungeons."

After a successful journey through the four minds, you encounter the Cave Master, an early mentor of man. The Cave Master drew his inspiration from The Wheel of Wisdom, the object of your quest.

The minds are encountered in a different order, depending on the direction you go when leaving the previous one. Each mind has obstacles that can be overcome only with the aid of objects or knowledge obtained in another mind, so you will need to learn the most effective order in which to experience the minds.

An Electronic Novel™ is a form of text adventure game which affords the player an enhanced ability to converse with the characters to alter the course of the story. You may address the characters directly, asking them questions about how to proceed,

etc. They may or may not give you useful information in their responses, but either way, the story line varies enough to hold your interest.

You address the characters by typing their name, followed by whatever you wish to say in quotation marks. For ease of typing, both the comma after the name and the ending quotation mark may be omitted, and capital letters need not be used. The following is part of a conversation I had with a lady in the Poet's mind:

lady "please tell me the word that goes in space 2

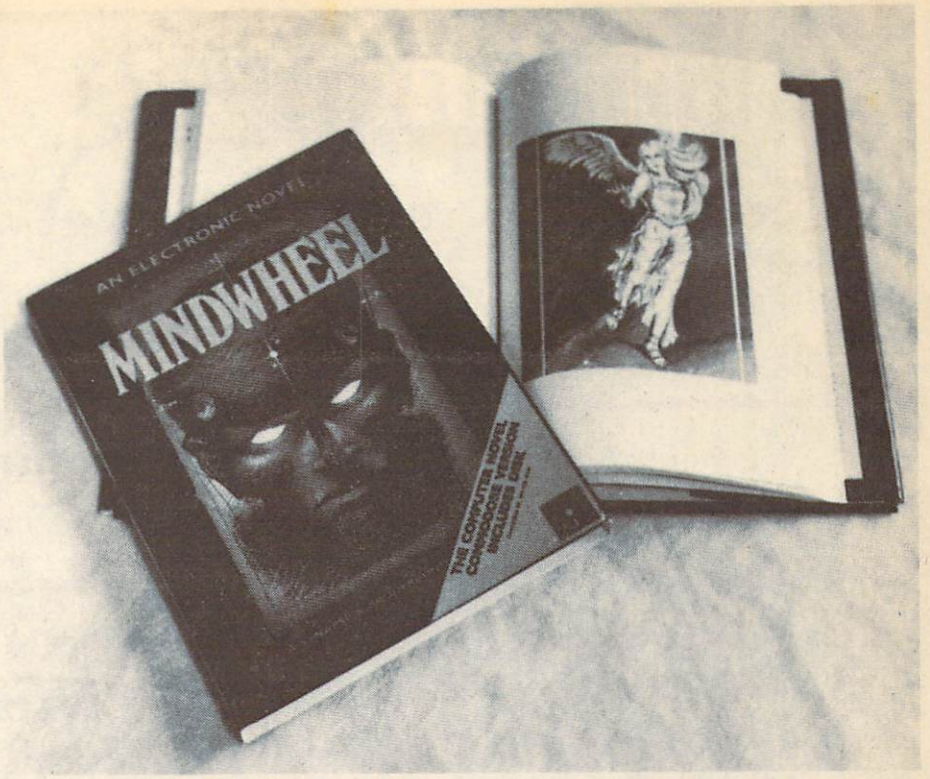
The lady says in a crystalline voice,
"I cannot do the thing you ask —
Nor is it for you to set me a task.
But if you show a poet's heart and wit, The mighty wings are a fit reward for it."

As you would expect, stumbling blocks are strewn in your path to make your task more difficult. In order to pass from one mind to the next, you will be asked to solve a riddle, or perhaps to complete a poem by filling in blanks. When travelling from the rock star's mind to the Generalissimo's, for example, your path is blocked by a large cage containing a winged woman. To pass, you must solve the following riddle:

The morning herald was never born.
His very beard is skin, his mouth is horn.

Uttering the correct response will dissolve the bars of the cage, freeing the trapped woman and clearing your path. In appreciation, the winged woman gives you a hint as to how to proceed, then disappears.

In the Poet's mind, your progress is hampered by a devil with a poem for you to complete. This I found to be a bit more difficult than solving riddles, but if you have looked at (examined) everything you passed along the way, you probably have been provided with the correct words with which to fill in the blanks.



The best advice I can give to a prospective player is to look at everything you encounter. If it will open, open it and look at it again. Help also comes to you in the form of Irv, a little green toad, who becomes your buddy, travelling about in your pocket. He gives you advice from time to time, some excellent, some not so useful. You can ask him questions, if you can get over the idea of talking into your pocket.

Story characters will attempt to halt your progress toward your goal, but defeating or outwitting them generally extracts from them yet more clues as to how to proceed.

Mindwheel does a good job of interpreting your questions and statements. At times, it seems to be trying to fool you into thinking this is reality. Included in the features of the game are commands to save your game (up to eight different versions) and to halt the progress of events so you may break for Mother Nature's necessities, such as eating dinner, or the occasional phone call. Also included is the ability for the player to slow down or speed up the evolving of character status, and the progress of events. This feature does not affect the speed at which text is presented on the screen. It merely affects the number of events that happen in a given number of moves.

The major complaint I have with the game is a familiar lament. The disk-based program loads and runs much too slowly. Even if you discount the time eaten up by disk swapping, the impatient player will find himself doing a lot of finger-tapping, waiting for the disk drive to catch up so he may type his next command. But patience will bring many screens full of interesting, albeit wierd text and challenging puzzles, resulting in hours of entertainment. A must-see for people who consider themselves good puzzle solvers. I recommend anyone give it a try.

■

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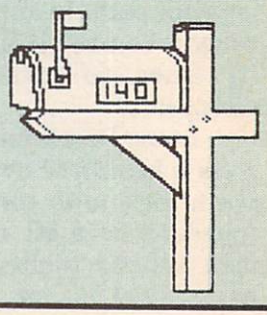

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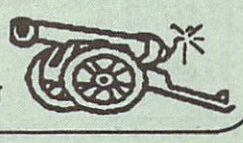

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Bank Street Filer

You would not think it to look at me, but I am Goldilocks.

In the dream, I am Goldilocks in the forest cottage, tasting of the different data base porridges left on the table before me. Here's **Superbase 64**, let's try that ... Youch!! That's too hot, a ponderous business-level program with a user's guide every bit as hefty as its price tag. Hmmm, how about this **Data Manager** in the Timeworks bowl, how does that taste ... Yuch! This gruel is stone cold, and it carries the bitter aftertaste of age. This one's been on the table too-o-o-o long. Hey, what's this? **Bank Street Filer**. Well, I dunno ... maybe ... ah, what the heck, I'll try it. *Hey!* Let's have some more! Mmmmm ... Ahh, now this stuff is *good!*

Bank Street Filer is a brand new product, designed to integrate with **Bank Street Writer** and **Bank Street Mailer**. Touted by Broderbund as an "Information Organizer", this program is aimed at a very specific market: *home* users. Well, Hallelujah! It's been a long time coming.

BS Filer (now cut that out) allows you to remain loyal to the first tenet of the Commodore Users' Oath: Death Before Docs. By making extensive use of windows, **BS Filer** is very easy to operate. And, because all of a file's records are held in RAM, any data manipulation such as searching or sorting is performed with stunning speed.

The program is enhanced by an outstanding manual, an on-disk tutorial, a free back-up disk (included), a utility which allows the user to easily customize *all* aspects of the program, and a price of under $40.00. All of which make **Bank Street Filer** a very tasty dish indeed.

Michael Daigle

Skyfox — Amiga 512K
from Electronics Arts

When those engines roar into action, you know you have power by the tail in the Amiga conversion of EA's hit arcade flight simulator **Skyfox**. The power is not only in the jet that you're piloting but in the supersonic Amiga sound and graphics.

Is that mortar fire sounding off to the left? Sure enough, pull it around and face a lineup of tanks prepared to blast a daring pilot out of the sky. Dive in (careful not to get dizzy) and nail the armored meanie.

The Amiga graphics are similar to the C-64 version, but faster and more smoothly animated. The stereo audio demonstrates that the Amiga is redefining entertainment software sound. Yes, this is Skyfox as we know it, only more so.

In the world of Amiga arcade action, One on One is hot but Skyfox is burning a wildly careening swath across the Amiga sky. Anybody got a Dramamine?

Bob Lindstrom

Mind Pursuit — C-64/128
from Datasoft

If computerized trivia games haven't already reduced your throbbing brain and shattered ego to shivering, quivering masses of protoplasm, here's one more prepared to whomp your self-esteem.

Graphics give **Mind Pursuit** some distinction among the hoards of trivia games. Unlike other games that tend to be all text, Mind Pursuit has an animated graphics board-game mode (unfortunately with a few irritating but not fatal graphics glitches) and a handful of audible and visual questions.

There's also a healthy range of options. Up to four players or teams can participate. There are three question types: true/false, multiple choice or fill-in. Players can choose to limit answer time from 30 to 60 seconds. And, in the style of any decent trivia game, there are (reportedly) thousands of brain-numbing questions with additional question disks on the way.

Best of all, Mind Pursuit is a little forgiving when it comes to the answers. In many cases, close DOES count. The program is flexible enough to accept answers that are nearly correct.

In honesty, there isn't much new here. This really is just another trivia game; but, Mind Pursuit does provide good value (despite those little glitches) and should provide hours of humiliating good times.

Bob Lindstrom

Deluxe Print — Amiga 512K and Dot-Matrix Printer
from Electronics Arts

Let's call a spade a bloody imitator. Yes, this is The Print Shop for the Amiga. It's by another company (The "real" Print Shop is a hit claimed by Broderbund Software) and it borrows a lot of those ideas; but, boy, did it ever learn some new tricks.

Like other print programs, **Deluxe Print** lets you design lots of items including signs, banners, letterheads, calendars and greeting cards. The Deluxe Print difference is that the graphics and texts in those items can be positioned just about anywhere you might want them (The Print Shop has several limits on text and graphics layouts); and, if your printer will support it, prints them out in full color.

You can use the ready-made graphics as they are, edit them to your taste or import Deluxe Paint images in the print-outs. The images can be sized, flipped, colored or copied anywhere on the screen.

Deluxe Print also offers a selection of several different border patterns and, in the text entry mode, a range of Amiga fonts.

When it's all put together on the screen, what you see is what you get. There will be no surprises when that paper starts pouring out of the printer.

Well, not pouring exactly. Like other print programs, the actual printing process is very time-consuming. Fortunately, Deluxe Print allows you to move to a CLI window during that process. You can't get started on designing another Deluxe Print item but you can indulge in various other activities as your free memory allows.

So, yes, this is another print program; but it's a print program that befits the graphics power and versatility of the Amiga. And by the way, a second Deluxe Print art disk with new libraries of ready-made graphics is already available from EA.

Bob Lindstrom

PSI 5 Trading Co.
C-64/128 *from Accolade*

Stop staring at me, you bug-eyed little space pirate, and start firing those lasers. Engineering, do we have power to the warp drive yet? This is the last time I hire a navigator who has a reputation as a loner.

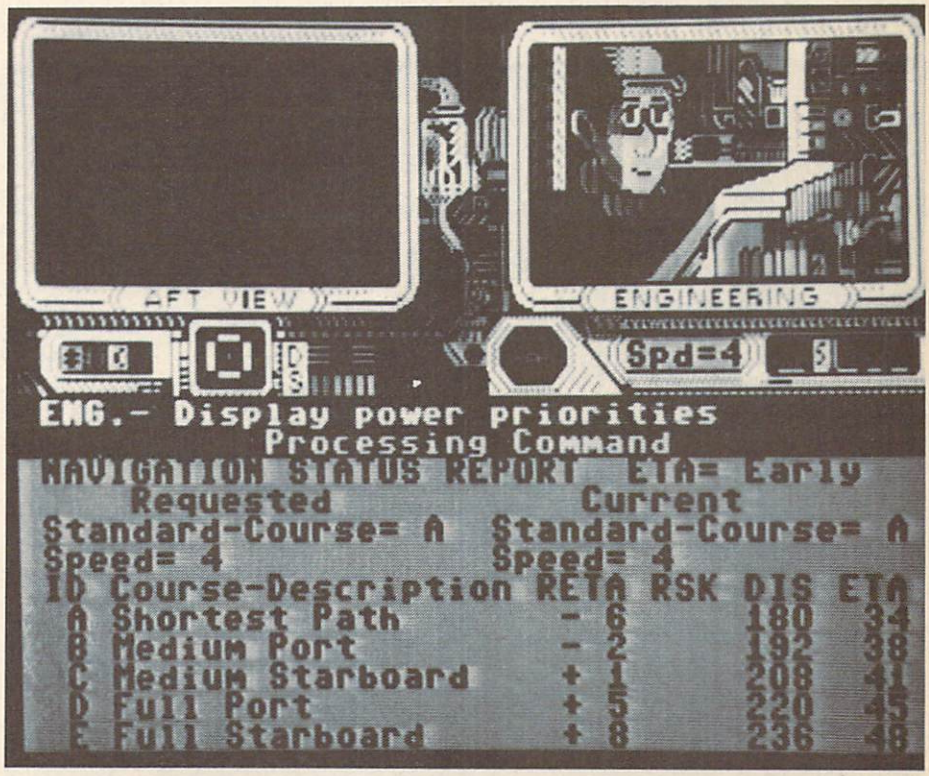
The tried-and-true genre of space trading games just got livelier with the addition of **Psi 5 Trading Co.** Not only has programmer Mike Lorenzsen added flashy graphics (quickly becoming an Accolade trademark) but he has also worked some characters and personality conflicts to humanize, or, in the case of bug-eyed crew members, alienize the trade-and-fight action.

Each game begins by selecting a crew. In the six job categories from engineer to weapons officers, there are several applicants. Skim through the resumes and choose the one *you* can work with. In the world of 21st century personnel, no one is perfect.

Then, grab a load of cargo and launch into the stars. The action quickly gets bizarre when the ship comes under attack from marauding space pirates. Communicating with each department, supervising the counterattack and soothing mussed egos among the crew is almost more than a mere human captain can manage.

Psi 5 brings it all together: wild action, challenging strategy and plenty of eye candy. This one's a hit.

Bob Lindstrom



Accolade's PSI 5 Trading Co. uses windows as an interface between the gamer and his crew.

Hardball! — C-64/128
from Accolade

For fans of arcade action baseball games, **Hardball!** is the answer to a beer-swiller and peanut-eater's prayers. In fact, hire some big guy to holler in your ear and another fellow to drop in the computer room with Bud and hot dogs from time to time and you might be hard-pressed to tell it from the real thing.

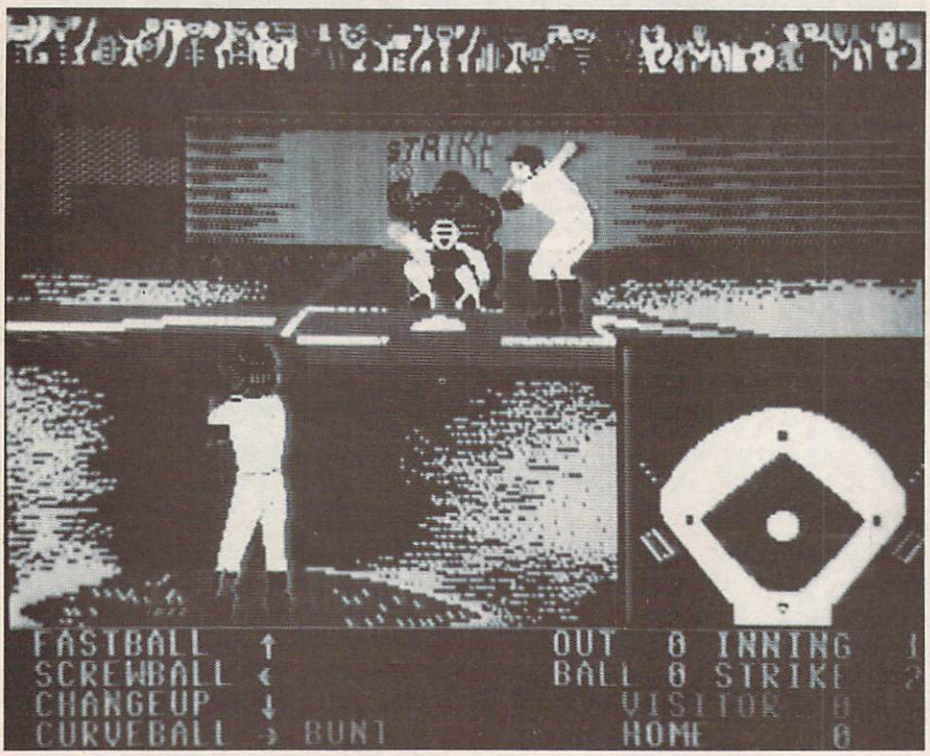
You won't have to waste a lot of time figuring out the joystick moves in this baseball game. The stick commands are simple to grasp, hard to master. You'll have all the moves down in about 30 minutes and then it's just a matter of sharpening up your eye and your reflexes.

And sharpening is what they'll require, particularly playing against the computer. On the mound, take your choice of several pitches. At bat, swing high, low, wide (wherever) or bunt. Steal bases. Catch a runner off base and tag him out. Just toss the ball from base to base to throw off the other guy's timing. Hardball! handles both the common and the nasty little tricks of America's (once-)favorite sport.

And the graphics! Throw in a few commercials and it would be like watching the game on TV. In batting and pitching mode, you get a view over the pitcher's shoulder. When the bat connects (not such a common occurence when playing against the computer, at least for beginners), the view changes to a wide-angle view of the outfield.

This program is very good and my current choice of baseball action games. However, look out Hardball!, Gamestar has announced an update of StarLeague Baseball with glamorized graphics. It's going to get crowded in the bullpen.

Bob Lindstrom



Hardball offers the player a TV camera view of the confrontation between the batter and pitcher.

ComputerEyes

ComputerEyes is a video digitizer available from Digital Vison, Inc. for $129.95 list price. I got mine for $99 and bought a black-and-white video camera to go with it. Inside the package is a small black box that plugs into the user port on the C-64, and a disk containing a short program. It has two knobs and one standard RCA input plug. Any standard video input is acceptable (camera, VCR, TV, etc.)

Using it is quite easy. Load the software program. Feed a video signal into the plug (a still-framed VCR picture, or a still on your video camera). Adjust the sync once by turning a knob until the program says the sync is correct. Adjust the second knob for contrast, and you are ready.

You can choose a quick (six second) scan in two shades of gray, or move on up to four or eight shades. The longest takes about 50 seconds to scan the picture. Then you see the picture on your monitor, and if you like it, you can save it to disk. The pictures take about 33 blocks on disk, and can be changed to various formats (printshop, doodle, etc.) for further modification, or hardcopy on your printer.

Better results are obtained from a higher contrast picture. It is more difficult for the digitizer to work with the poorly defined gray levels in a washed-out picture. I have had fun making digitized pictures of myself, and still frames from my favorite movies. I even put some on my computer bulletin board for download. It's fun!

John Olsen

Announcing . . .

SEQUEL

by Bob Richardson

SEQUEL IS NOW ON-LINE
Call 24 Hours a Day
At 300 / 1200 Baud —
See it for yourself!
(503) 659-5752

SEQUEL is finally available! Bob Richardson has taken all of the suggestions from sysops using **Modem Master** and incorporated them into what we feel will become the new standard for Commodore 64 bulletin boards.

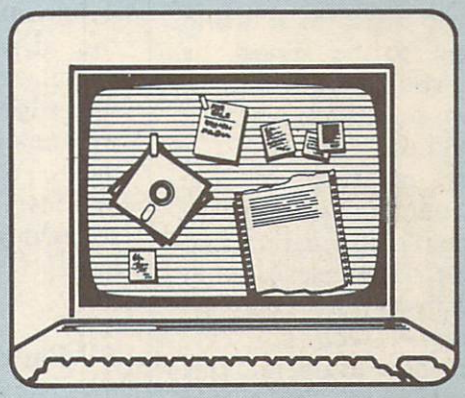
SEQUEL is by far the most powerful and cost effective BBS on the market. The simplicity in design and the ease of use that made **Modem Master** the best-selling board in the country last winter have been combined with a multitude of new features. Offering up to seven message bases, with individual read/write access, **SEQUEL** provides for 33 different combinations of security levels. Message bases may be hidden to provide yet greater security.

Messages are automatically formatted for full right/left justification, and may be read by individual selection. The user is provided with the ability to scan all new messages, messages addressed to the user, or messages written by the user. A new mail forwarding option is also included. Maximum SAVE time for a message on the 1541 is **only 7 seconds!**

E-Mail commands are in a separate menu and allow individual deletion and E-mail forwarding. E-Mail check at sign-on is performed in as little as 1/2 second.

Other features include:

- Fully supported by **both** X-Modem and New Punter (C1) protocols
- Supports up to **four** dual drives
- Download libraries may be organized in up to 99 directories, with as many as 99 files in each directory (depending, of course, on the capacity of the disk drive configuration being used)
- Each directory may have its own user security level, cost (if any), and read/write status
- Directories are stored on the file transfer disk, **not** the data disk so transfer disks may be conveniently changed **while** a user is online!
- A unique Personal File Tranfer system which allows a user to send a program to another individual user



- **Other features:** — system poll/survey; history log; nickname; phone number; remote sysop access; information files; **accurate** clock/calendar; fully automated **unattended** operation; emergency file restoration and the ability to later add user expansion modules

Modems supported by **SEQUEL** include the Commodore 1650, the "old" 1660, the 1200 baud 1670, Mitey Mo, MPP 1064, the Westridge 6420, Hayes Smartmodem, VolksModem, TransCom and many others which are compatible with the ones listed above.

Now available from Aquarian Software **ONLY $39.95**

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The Tube: Part II

From TV's To Monitors

by Grant Johnson

The essential thing to understand about monitors, TV's, and the picture tubes that they support, is that they are communication devices. One measure of the power of a communications device is the *distance* over which it can operate. The telephone would have made no sense in a world small enough to be served by shouts. Likewise, there would be little use for television where a window would do.

Another measure of the power of a communication device is the volume of information that it can deliver. The television in your home delivers thirty complete pictures every *second*. Yet, children learn how to operate this powerful instrument even before they can throw a ball with any precision. Such apparent simplicity is the product of a truly global industry. Some of the keenest minds, from Europe to Asia, have had a hand in extending our vision from Gilligan's Island to Saturn's rings and beyond.

Homecoming

The home computer was born at a time when television technology had more than a quarter century of domestic developement behind it. The natural thing was for this newcomer to tap into the existing technological base. Atari's video games and such early computers such as the VIC-20 were designed to be used with the TV's that had preceded them into the home.

Personal computers are now a force to be reckoned with in the marketplace. Truth is, the display requirements of computers (and the digital technology that underlies them) are now the cutting edge in video advances. But we are still in a state of development. To understand your display options, you must understand something of the old as well as the new.

TV Basics

The form of television broadcasts has been standardized for many years. The standard in the United States takes its name from the National Television System Committee (NTSC) that created it for black and white between 1940 and 1941, and for color between 1950 and 1953. There are other standards, such as the PAL (Phase Alternation Line) system used in Europe, which are supported by some computer equipment sold in this country, but such support is usually just an option.

The most efficient way to connect an information source with multiple and widely disbursed receivers is through radio transmission. A signal is emitted into the air and, as it spreads throughout a region, receivers sense its effects on their antennas.

The trouble most people have in connecting computers to monitors is in understanding the link between the two. Obviously, the link between them is some sort of electronic signal and the requirements for this signal, are most easily understood by working from the end points back towards the middle.

Imagine a camera focused on a scene. As the electronics in the camera scan the scene, the information about light and dark (also called monochromatic information) from each scan line is transmitted to the display tube. When it all works correctly the information about the light and dark areas are reconstructed by the display tube one line at a time as depicted in **Figure 1.**

Thus far, there are three seperate types of information that must be conveyed between the source and display: horizontal and vertical synchronization, and the light/dark information that forms the picture's content.

In color systems, the image in the camera is divide into three seperate images which pass through color filters. Essentially, there are three cameras within the color camera, each looking at the scene in its own color. The filters

remove all but the blue light from the image that the blue camera scans, the red sees only red and the green, a green scene. These three separate signals eventually find their way to the three guns in the color CRT. See **Figure 2.**

The total number of different types of information from our source is now now up to five: horizontal and vertical synchronization signals, red, green and blue information. If the distance from source to display were short, it would be practical to use wires, and we could use as many of them as we needed. But, with broadcast information, no wires were used until recently — pictures flew from here to there on waves of radio energy.

Waves

What is a radio wave? Well, let's work up to that question a step at a time. A radio wave is a regular electrical disturbance. It is set in motion by a transmission antenna. There are all kinds of directional antennas, but we will look at a simple one here. An antenna is charged and discharged in such a manner that the space surrounding it is affected. With a simple antenna, the disturbance travels outward in a sphere. Looking down from above, if we slice through this sphere, as in **Figure 3,** you could imagine regions of high electrical charge interspersed by regions of low charge. These rings of varying charge spread just like the waves on the surface of a pond after you have thrown a stone into it. Shown below is a diagram of what the wave looks like graphically.

With radio waves, you have considerable control over the shape. Imagine that you have a flexible piece of roap, two people and a smooth floor. If the roap is laid slack on the floor and then one end is moved back and forth, crests and troughs will form and travel from the end that is moved (A) to the other as in **Figure 4.** If

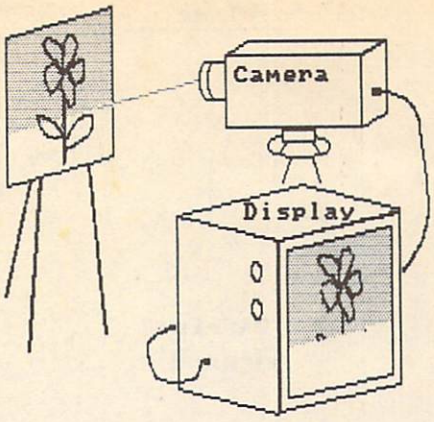

Figure 1.

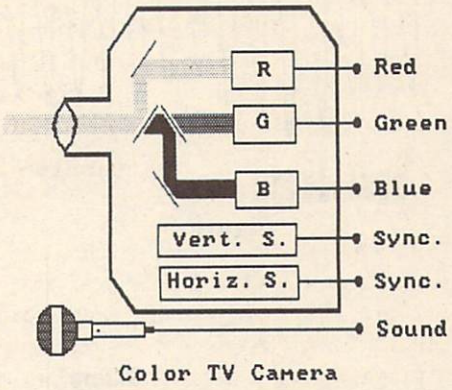

Figure 2.

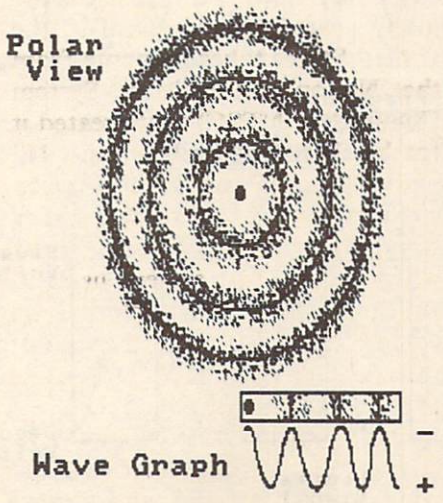

Figure 3.

the person at A continues to move the roap back and forth at a steady rate, the person at B will feel the rhythmic, cycling tug from the energy flowing through the roap.

The movement of A's hand from side to side and back to where it started is called a cycle. As the waves travel down the roap, they are also travelling through time. If A stops moving, it will take a certain time for the last wave to reach end B. If we want to measure the frequency of A's motion, we can measure the distance between the crests in the roap.

The regular undulation of the roap becomes a sort of base line or carrier for any messages that might be transmitted down it. Messages are transmitted through intentional variation. But you must have something to vary, and that is the job of the carrier.

Now if A wanted to send a message through the roap to B, he would have to introduce some kind of variablility into his movements. There are two ways to do this: he could swing the roap more widly from side to side without changing the rate, or he could vary rate (frequency) at which he moved the roap.

The first method (see **Figure 5**) is called amplitude modulation, since it results in the height of the crests being changed (while they remain the same distance apart). B will feel a changing pull in his wrist as the signal comes through, but no change in frequency. This is the method used for AM radio.

The second method, and the one used for television and FM radio, is called frequency modulation (see **Figure 6**). Notice that the waves are all the same height with this method. The receiver at B will feel quick cycles mixed in with longer ones.

Analog / Digital

Both of these methods of transmitting signals are analog. Analog is one of those concepts

that is so natural and fundamental that it is difficult to describe — like the number (not numeral) three. "Three-ness" is hard to point to, except by example. Analog derives from Greek words that mean "according to" and "proportion". A phonograph record is an analog model of the sound it represents. The surface of the groove undulates in proportion to the frequency and intensity of the sounds it represents. A photograph is also analog.

Analog computers are devices whose input and processing are continuous. The fluid logic in a car's automatic transmission is an analog computer. The quantities calculated and processed are proportional to the pressures within the logic. Before the advent of the digital computer, the best number crunchers in the world were comprised of gears and pulleys and worked rather like a slide rule.

Things digital are easy to find these days, and are characterized by the division of information into discrete units — often digits. The familiar graph of the Dow Jones Industrial Average is digital. Sample points are set out on a graph and (to make them easier to see and comprehend) are joined by straight lines. Digital computation is versatile and relatively cheap. It is no accident that affordable computers are digital.

The loudspeakers in your stereo and the cathode ray tube (CRT) in your TV or monitor, however, are *analog* devices. We shall see later the kind of engineering problems this creates. But before we move on, a word about digital signals. In our area of interest, computers, digital signals are binary. They consist of a voltage that is either on or off. Most often that means either zero volts or five volts (see **Figure 7**). Notice that the signal has square corners on it. For devices such as computers that process things in units, the more nearly square these corners, the better. Theoretically,

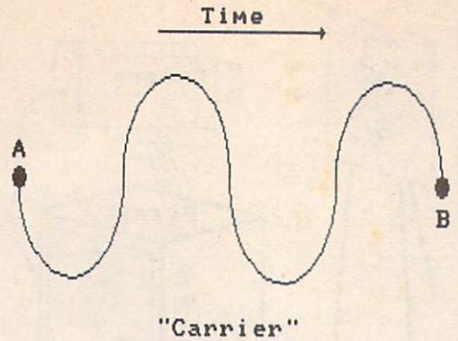

Figure 4.

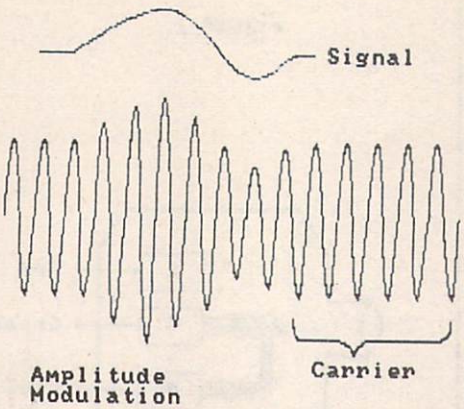

Figure 5.

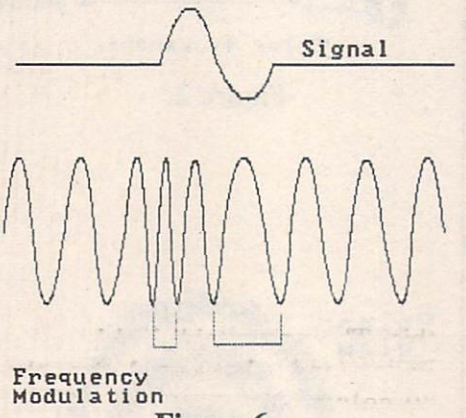

Figure 6.

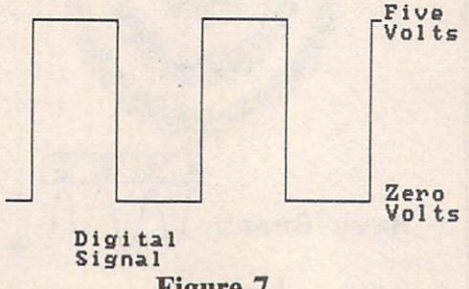

Figure 7.

there should be no "in between" states.

All signals deteriorate over distance, and of all the means of transmission we have seen so far, the digital or "square wave" is the most vulnerable. Even using too long a wire or a wire that is the wrong size will round the corners of this signal. As this happens, the timing of the signal becomes sloppy, and, with digital circuits, timing is crucial.

Broadcast

When television is broadcast, the RGB, monochrome, syncs and the rest, must be combined into one very complex radio signal. First of all the vertical synchronization signal is encoded. It enables the receiver to know when to begin the start of a new screen. Next the horizontal synchronization pulses begin.

The time between horizontal syncs is filled with light and dark information. In terms of the display tube, the vertical sync places the beam at the top of the screen and the horizontal sync starts the horizontal scan. The intensity of the beam is then controlled by the light/dark information. Sound, if any, is added to the broadcast signal and is continuously decoded by the receiver.

In a color broadcast, the color information is encoded through some tricky geometry. It is not essential that you understand the details, but in case you're interested: The three colors are phase shifted by 180° with respect to each other as they are added to the broadcast signal. A "color burst" is also added that sychronizes the receiver for this color information. The upshot of all this is that the color information is phase shifted, frequency shifted and shoe-horned into the broadcast signal.

A digital watch, minus the case and wrist band, now costs well under two dollars to produce. It is a complete computer and even

has a display. Yet, it should come as no surprise, after this very brief discussion of the standard broadcast signal, that an instrument capable of turning that compound mass of radio frequency information back into a picture costs many hundreds of dollars.

Up until a decade ago, if you wanted to see color on your computer terminal, you would have had to spend about $15,000 just for the monitor! The driver for the monitor (called a "display generator") was a completely separate system and was basically a minicomputer. Now you know why your '64 has a TV output on the back.

NTSC Output

#The production of a standard TV signal by a home computer is accomplished primarily by a large-scale integrated chip that is a marvel. In the Commodore 64, this chip is the Video Interface Chip (VIC). Since it is not programmable and does what it does in the background, very little is written about this chip. But it makes the microprocessor chip in the '64 look ordinary by comparison.

The VIC collects digital information from various parts of the computer and assembles it into two signals, luminance and color. Luminance contains the monocromatic stuff as well as the vertical and horizontal syncs, and color contains a rough approximation of the RGB content. The information from these is sent through a radio frequency (RF) modulator, where it is combined and put on a carrier (either channel 3 or 4) of the sort that TV's expect.

Frankly, what we have here is an amazing contraption. On one hand, we have a source that is making a supreme effort at producing an NTSC signal, and, on the other, we have a display device that is going through complex gyrations to turn it back into a picture. If it were not for the history and economics of the situation, NTSC would make no sense at all.

A better way

No long-distance communication is required between computer and display, so the first step to improving the situation is to remove the NTSC step entirely. The result is the composit signal. Everything needed is in there, but the computer doesn't bother to put it on a carrier and the monitor (no longer called a TV) need not be equipped to decode the carrier. Note that, since the audio portion is ordinarily a part of NTSC, it must now find its own way to the monitor or sound system.

The only reason for combining all the necessary information in the first place was to enable it to be transmitted through a single radio signal. From this point on, the method of improvement is "divide and conquer", the next step being to separate the color from monochrome information. The 1702 is an example of a monitor able to use such a signal. The improvement is plain to see.

RGB

The next step is a relatively long, but rewarding one. The red, green and blue information is separated. There are two main ways of going after you have done this. The way established by IBM PC's (and that used by the 80-column output of Commodore's 128 PC), is for these signals to be passed to the monitor as digital signals. Remember though that the CRT is analog by nature. Therefore, the monitor must convert these signals into an analog form before they can be sent to the CRT's guns.

In partial compensation for this, some systems (the 128 PC and the 1902 monitor are examples) supply an "intensity" signal. The intensity control enables the computer to produce an image on the screen and vary the brightness of the objects without changing their color. You could have a light green sentence, for example, with some of the words at different intensities.

The other RGB way of doing things is for the computer to produce analog signals — RGB Analog. Mated with the proper monitor, the computer, for all practical purposes, takes direct control of the CRT. Analog signals are smoothly variable giving natural control over color as well as intensity. Using this method, the Amiga can produce 4096 distinct colors.

Precision

It might seem at first that eliminating all the old radio communications paraphernalia might make display systems cheaper. Anyone who has gone shopping for monitors knows this not to be the case. There are two reasons for this: As you move away from NTSC, the possibilities of improved performance increase, and most manufacturers capitalize on this. The display on a composit monitor is far better than can be delivered by televisions. As many of you who have connected your 1702's to video equipment (such as video tape recorders) have discovered, the monitor has a very sharp picture. That performance doesn't come cheap.

The second reason, which becomes more evident as you move on to RGB monitors, is that they are not made by the 100 million — there is a sacrifice to be paid for giving up economy of scale.

As computers gain more control over our monitors and monitors become more precise in their response to that control, it does make life more complicated for the computer owners, but the results can be stunning.

■

I'm Sorry, But I Don't Speak Hexidecimal

by Shelly Roberts

"If you could only program," a compu-buddy said to me the other day when I wasn't really paying much attention, "You could be a real hacker."

Be a real hacker? Hey! Wait a minute. Whaddid she mean by that? It sounded like a compliment. Sort of. At least it sounded like she sort of meant it complimentarily. But still ... I COULD — BE a real hacker?

A real hacker? A *real* hacker? A real *HACKER?*

Real hackers have been known to lose track of whole months at a time out of their lives, sitting at their funny-shaped computer chairs staring into a monitor. I qualify.

Real hackers show definite withdrawal symptoms (irritablity, crankiness, twitching) when some force of nature causes them to have to lose contact with a keyboard for more than a few hours. I qualify.

Real hackers develop an abiding fondness for Chinese take-out because it means they never have to leave their keyboards to cook anything. Besides, using chopsticks develops better hand-eye coordination, a highly useful computer skill. I qualify.

Real hackers rarely if ever have enough money left over to pay the rent. And never have enough to pay back that twenty they borrowed from you last week because they have just spent their last cent on the latest watchijigget to attach to their computer. They do, however, always have enough money to buy the latest watchijigget — usually no more than 15 minutes after it hits the market. I qualify.

Real hackers' floorboard outlets qualify them for membership in the fire-hazard-of-the-month club. And they never have any sockets left over to plug in even a mini-lamp which is all right, because real hackers don't need any more light to see by than what they can get from their monitor's reflection. I qualify.

Real hackers have a phone book full of telephone numbers of friends they can call at two, three, or four in the morning to help them figure out why the header has disappeared from a disk that was perfectly good a few reasonable hours ago. I qualify.

Real hackers actually use those numbers at two, three, and four in the morning to call other real hackers, and expect to get the same kinds of calls in return — because that's what friends are for. I qualify.

Real hackers *never*, ever read the manual first. Sometimes they don't read the manual at all. Except for emergencies. Boot up is all. Reading the documentation is for wimps and sissies. I qualify.

What's the big deal about being able to program, anyway? I know where the power-on switch is. I can be up and running on nearly any word processing, database, utility, or flight simulation program on almost any model anything. I can fix the Xerox machine for anything short of a desperate need for an emergency service call. (Some skills are ultimately transferrable.)

All of which makes me an "Applications Hacker" of the first order, and there is absolutely *nothing* unreal about that!

Besides, in another couple of computer generations hexidecimal will be a dead language. Like aramaic.

I think my friend was just being an electro-chauvinist. A compu-snob. Just because she can work

```
IFX=X+1ANDY>(R*128)+11THEN
GOTO6000:X=X+1
```

into a sentence, she thinks that she's better than I am. *Phooey!*

I can hack with the best of them. And there are thousands of you out there just like me.

Applications Hackers of the world, arise! You have nothing to lose but your shames!

■

Beginner's Corner

The Disk: Part I

by Mindy Skelton

Five-and-a-quarter-inch floppy diskettes, floppies, disks; call 'em what you will. They make life worth living. OK . . . maybe that's a little strong, but if you're a normal red-blooded computoid, they are a vital part of your life. You look at them every day. You clip them, stack them, throw them, use them, but have you ever really thought about how they work. Well, that's what we're gonna do this month. Sit back and be prepared for a mishmash of semi-technical and non-technical information.

Pick up a disk. That little square you hold in your hand is the "sleeve" of your disk. It covers all of the disk except for the area under the oval *read/write slot*, the hub opening in the center of the disk, and the small *index hole*. There is also a square *write protect* notch in the upper right-hand corner. This notch is important, but it does not actually expose any of the disk surface — more on this later in this article

Back to the sleeve. It is there to protect your disk from dust, dirt, fingerprints, soda and all the nasty things out there just longing to do in your poor little disk. Now you can defeat its purpose if you really want, but, trust me, it's there to help you. (I have one extreme computoid friend who, for a while, was using disks without the protective cover . . . just the little circles of vinyl . . . to prove how macho he was. The disks worked, but I really don't advocate this as a way of life.) Normally, the disk is accessed only through the read/write slot.

These assemblies of plastic are referred to as "floppy" disks, but don't take the term floppy *too* literally. If you bend or crease the disk, you can chip away or damage the coating or prevent the read/write head from being able to access the information, and bye-bye disk. At the extreme edge of believability, you have another friend who discovered the hard way, that folding a disk and sticking it in his pocket, did not in any way improve the disk.

Extreme heat and extreme cold are also hard on disks. As a general rule of thumb, if you are comfortable (I'm referring to temperature range), so is your disk. If your disks become very hot or very cold, wait until they adjust to room temperature before you use them. Exercise reasonable care.

So here you are, holding your little square sleeve. What's inside? Inside is a circular piece of vinyl which strongly resembles a 45 RPM record. This disk is covered by a thin coating of magnetic material much like the coating on the tape in your tape recorder. The use of magnetic coating means that you should not, under *any* circumstances, expose your disks to a magnetic field (i.e. don't hold them up on the wall with a magnet!)

Like a record, there are grooves on a disk, but instead of one continuous groove, a disk is divided into a series of concentric circles called *tracks*. Your standard disk is measured at 46 TPI (tracks per inch), although there are higher density disks (more on density later), which are 96 TPI, or even higher. You, as a Commodore user, can probably live with 46 TPI. A 46 TPI disk will hold a maximum of 40 tracks. With the exception of certain protection schemes, the Commodore is usually formatted to hold 35 tracks. (Note: more on formatting next time.)

As you continue to examine your disk, you may notice a ring of plastic around the central hole of the disk. This ring is called a *hub ring*. It helps keep the disk from being deformed while it's in the drive, and is usually a good thing to have. I say usually because some printers can't deal with hub rings . . . DEC drives for example, hemorrhage internally if presented with a hub ring.

You may not have noticed this, but there is almost always an exception to everything when you're working with computers. I wonder if this could be generalized to life? Oh, well . . .) OK. Put the disk back in its sleeve, and let's go on.

When disks are discussed, you may hear debates concerning the relative merits of double-density vs. single-density, and double-sided vs. single-sided. I am

not going to try to decide the issue of what is better. I get enough hate mail as it is. But, I will translate these terms for you.

Density refers to the thickness of the magnetic coating on the disk. A double-density disk has a thicker coating than a single-density. Since we're talking thousandths of an inch here, you're not going to be able to tell the difference by looking. A thicker density coating can hold a stronger signal, and can hold more information.

The 96 TPI disks mentioned earlier are quadruple-density disks. It's getting so it's real hard to find single-density disks, since disk prices have dropped so much, but now you know what they are.

You will also hear people talk about *single-sided* versus *double-sided* disks. Some people become quite adamant about the merits of one over the other. Single- and double-sided have nothing to do with the density of the disk. Basically, a double-sided disk is one that is guaranteed by the manufacturer to be free of defects on both sides. Other than that, there is very little difference. One school of thought holds that there is, in fact, no difference.

As we will discuss next month, different disk drives access different sides of the disk, and the disk manufacturer has no way of knowing in advance which side of the disk will be in use, so *theoretically*, both sides of a single-sided disk should be good.

The single-sided/double-sided debate moves us into another area worthy of a few minutes' contemplation; notching or "flipping" disks. A lot of people these days are "flipping" their disks in order to use both sides and double their storage capacity. Should you be one of them? We mentioned earlier that there was a write protect notch on your disk. When this notch is open, the disk drive can write information to the disk. When the notch is covered nothing can be written on the disk (unless you have some sort of hardware device to override the write protect ... but we're not even gonna *talk* about that sort of thing).

If you turned a disk over and put it in the drive with the front side down, the corner which used to have the notch, will now be solid plastic, the drive will think the disk is protected, and you won't be able to use the disk. Flipping or notching a disks consists cutting another write protect notch on the left-hand side of the sleeve (this notch will be in the upper right-hand corner when the disk is turned over). You can now use the back of the disk. Lovely idea isn't it? And so simple. Who could possibly object?

Well, there are a couple of objections. On the inside of the sleeve of your disk, there is a soft fabric coating. This coating collects the some of the dust which settles on your disks and brushes it into the corner of the sleeve. Some parties contend that when you flip the disk and use it while it is rotating in the opposite direction, all this dust will be redistributed over the surface of the disk.

Other people say that if you flip a single-sided disk, you have to just take your chances with the un-guaranteed side of the disk. Still other people will warn you of the danger of losing data more readily if the disk is double-sided, and will advise you not to double-side disks that are going to be used to store important data. All I'm going to do is tell you that all the above is true, but I *still* double-side a lot of my disks. You now have the information to make an informed decision for yourselves, don't you.

■

Amiga Monthly:

Commodore Clams Up, Amiga Software Sounds Off At CES

by Bob Lindstrom

Computer Columnist: Who was that home computer I saw you with last night?
Commodore Executive (nervously): That was no home computer. That was my Amiga.

Everyone had a great time at the summer Consumer Electronics Show, June 1–4 in Chicago. The C-64, known after its facelift as the new 64C, basked in the admiration of its fans. Computer company executives started hinting that a new wave of personal computer enthusiasm would soon be upon us. And reporters and columnists ate and drank without charge for four debaucherous days.

Everyone had fun except the Amiga. Once again, Commodore made the Amiga stay home, maintaining her role as a Cinderella of the computing world who gets out of the corner only during Comdex.

In explaining why Amiga wasn't being shown at the country's largest trade show, Commodore had more excuses than a swinger at a VD clinic — they had all the dealers they needed; the Amiga isn't a home computer. Make up your own.

This time a Commodore spokesperson explained to me, somewhat reasonably I have to admit, that Commodore didn't want the mass merchants to see the Amiga at CES and erroneously assume that Commodore was ready to flood Amigas into Toys 'R Us.

Well, good for Commodore and its dedication to computer speciality dealers. And good, too, for the fast-talkers who love to roam the show floor speculating on why Atari was ballyhooing its 520ST and Commodore didn't have an Amiga in sight. (Though, in Commodore's defense, Atari also tended to leave its computer specialty machine, the 1040ST, at home.)

Make no mistake, there was plenty of Commodore-Amiga chatter heard in display booths and hospitality suites all over Chicago during the show.

Rumor has it that Commodore's free Amiga monitor promotion made our favorite computer one of the hottest items in the business. Streetcorner estimates were putting Amiga sales at 20,000 during the month of May alone.

On the negative side, programmers throughout the show still were bugged by the poor quality of Amiga development software, notably the slow C compilers. It might be nice if Commodore would debug these guys by lighting a fire under Lattice to speed up their drowsy compiler. Or maybe they should just send everyone a copy of **Modula 2**.

The laggardly appearance of Amiga software has cost Commodore some credibility, as well. One spokesperson for a major Amiga software house was now referring to the machine as a "prototype" of the next generation of personal computers. That's dangerous talk, particularly since the Amiga is so open-ended that it can become just about anything at all by tweaking the system software or, perhaps in special cases, adding extra hardware. This baby is built to grow and to change with the time. The hot-shot Amiga developers in *The Guide* country (around Portland, OR) have begun circumventing **Kickstart** and writing their own operating systems for specific applications.

And where was Atari during all of this jabber? Atari was cool. They were busy in their booth hooking up several thousand dollars' worth of music keyboards and synthesizers to an Atari computer in order to give demonstrations of how great the 520ST sounds. Heck, I'd sound great,

too, with a drum machine, Yamaha DX-7, Casio CZ-101 and assorted music hardware hooked to me.

Gossip be damned, however, the second half of 1986 should see no lack of high-quality Amiga software, if a reasonable percentage of those demonstrating new products come through for us.

Electronics Arts continued to be the best friend of the Amiga with seven more titles for summer 1986, including the long-awaited **DeluxeVideo** and the remarkable **Marble Madness** ($49.95), both of which should be available now.

If you haven't seen **Marble Madness**, don't wait. This is the best arcade adaptation ever done for a personal computer. At $1295, the Amiga is expensive for a game machine but I suspect this puppy will sell a few Amigas to the hardcore joystick benders.

EA should have released a **DeluxePaint Art & Utility Disk** ($29.95) and **DeluxePrint Art Disk #2** ($29.95) by now. More pictures, more tools, more stuff.

Instant Music ($49.95), a jam-with-your-joystick music program (remember **Dancing Feats** ?), is the first Amiga program to produce three-part harmony using a single Amiga voice.

Finally, EA is distributing Software Country's **Chessmaster 2000** ($44.95) and Origin System's Amiga version of **Ultima III** ($59.95).

The vacuum for a powerful Amiga database will be filled by Precision Software's version of **Superbase** for the Amiga. A relational, disk-based database, this program uses some of the Amiga graphics to provide novel and convenient ways to search and scan records. According to Precision's Managing Director, John Tranmer, it will be sold in three versions for the home ($149.95), business ($249.95 ?) and in a developers' package that will allow full access to a built-in database language.

LogiStix, like **Superbase**, hails from Great Britain. This is an integrated business package for the Amiga that brings together planning and decision module, database, timesheet, spreadsheet and business graphics.

Batteries Included still is promising an Amiga conversion of its successful IBM program, the **Lee Isgur Portfolio System**, a stock management package ($249.95). The Canadian company also has scheduled **BTS The Spreadsheet**, a 1000 × 1000 spreadsheet; **I*S PaperClip Elite**, an expanded version of the popular C-64 word processor; and, surprisingly, **I*S Degas Elite**, another Amiga drawing program which they describe as a virtual desktop publishing system.

Activision (and its Gamestar and Infocom subsidiaries) announced a slew of Amiga entertainment software including **Hacker II: The Doomsday Paper**, the sequel to one of 1985's biggest hits; **Little Computer People; GBA Championship Basketball: Two on Two**, a superb sports simulation that goes Electronics Arts' **One on One** two better; **Championship Golf**, a realistic golf game that recreates world-famous courses; **Championship Baseball '86**, a "sexed-up" version of Gamestar Baseball; Garry Kitchen's **GameMaker**; and a provocative Infocom text adventure, **Leather Goddesses of Phobos** (as kinky as it sounds).

And it goes on (you're gonna have to pawn the kids to afford all this software): **Mean 18** from Accolade; **Winter Games** from Epyx; **Oo-Topos, Transylvania, The Coveted Mirror** and **The Crimson Crown** from Penguin/Polarware; **Computer Baseball** from SSI;

Video Vegas from Baudville; Mindscape's **Deja Vu**; and **The Pawn**, a graphic adventure from Firebird.

The best new company to watch? That's easy. Cinemaware (to be distributed by Mindscape) brings together sci-fi author Jerry Pournelle, **Sundog** designer and *Byte* columnist Bruce Webster, **Chipwits** designer Doug Sharp and artist Jim "Red Porsche" Sachs, among others, for movies on disk with titles like *Defender of the Crown* and *King of Chicago*. Producer Bob Jacob was booting up some demos that look hot, hot and hot.

Before I sign off for this month, several quick words about the next Amiga operating system. I have been browsing through beta test versions of **Kickstart 1.2** and **Workbench 1.2** for a few days and, though still buggy, they decisively beef up Amiga's system software.

A few highlights:

- Requesters to insert disks are now timed so users won't trash their floppies.
- Ramdisk is about 30 percent faster and has a Workbench icon.
- When you drag an icon, you drag an icon. No more red pointer, the icon actually moves into its new position and several icons can be moved at once using a shift-click sequence.
- A newly-added Expansion drawer prepares the Amiga for hard disk additions.
- Don't junk those 5.25-inch drives in anticipation of the Sidecar IBM emulator. The 1.2 system software will format and address those 5.25-inch as 440K, single-sided Amiga drives.
- Serial communications are much more versatile with a new parameters menu accessed through Preferences.
- **Notepad** has been cleaned up and enhanced.
- Okidata and ImageWriter printer drivers are included.
- A Diskdoctor command will be provided to repair corrupted disks.
- **Workbench** can boot up in high-resolution (640 × 400) mode, perhaps in anticipation of long-persistence monitors that Commodore should be releasing later this year.

Next month: **Mind Walker**, the now-legendary Amiga game, and graphics software from Aegis. In the meantime, remember — computers are your friends.

■

Computer Widow's Compendium

by Lyn Chase

Our wooded wonderlands — the retreat of young and old alike — are no longer safe. Computers have invaded. We have met the enemy and lost. Please allow me to elaborate.

I am, at this moment, sitting next to my husband deep in the woods of Jessie M. Honeyman Memorial State Park near Florence, Oregon. We are surrounded by tall trees and huge sand dunes. (We are also surrounded by 60-foot recreational vehicles complete with living rooms, bathrooms with showers, and microwave ovens, I suspect.)

We are in our Volkswagen camper van with *no* livingroom, *no* bathroom, and certainly *NO* microwave oven. But we have, right here in our primitive little home away from home, a Commodore 64 with 1541 disk drive and green screen monitor. While Jonathan plays amidst the lush green foliage, I am writing with pen and paper. Randy has the computer powered up with a word processor and a fairly large "boom box" sits inches away playing the likes of John Prine and the late Steve Goodman.

This all began some months ago when we began to plan a vacation with Randy's family who would be visiting from Idaho. This would all coincide with Jonathan's third birthday. A camping trip was decided upon and reservations were made at the park. Then, on a spur of the moment consideration, we traded our Mercury Lynx for a 1978 Volkswagen camper van. Having had no vacation for nearly three years (save for the trip to Seattle for a computer show in early 1985), I was ready for a little fresh air, sunshine, and roughing it with my family.

But there was a problem. Randy was way past deadline with at least four stories for this issue. I was past deadline with this column. The decision was made to proceed with this trip BECAUSE --campsites now have electrical hookups. The computer could accompany us! Hallelujah! Progress has come to the wilderness.

Now don't get me wrong. I'm all for real toilets instead of bushes or outhouses. I'm for hot showers. I don't even have objections to the pay phones and newspaper stands placed strategically around the park. But the beige brute should have stayed home.

Of course, there are the obvious reasons that it should have been kept in it's cozy little office upstairs — it took up room in the van. It probably tossed its chips at travelling 300 or 400 miles. It had to be protected from heat and thieves. It had to be painstakingly set up and put away each of the three days.

But the *less* obvious reason should not be ignored. Guilt. Randy would set up the computer to work, then would feel guilty at working instead of playing with his family. Then he would put it away to play with his family and feel guilty that he wasn't working. What better setting to be caught between a rock and a hard place?

One of my greatest concerns on the subject is this: we have had our van less than a week and the computer has accompanied us on our first camping trip. Have we set a precedent? Will the computer begin begging to go on outings to cool its innards with fresh mountain air? Will it begin directing us to visit only parks with electrical hookups? And what will happen on the fateful day that we go camping in eastern Oregon far away from computer supply stores and (gasp!) run out of data disks?

And what of little Jonathan, already a three-year-old computer junkie? Can he learn to appreciate the scenic beauty of nature when the computer beckons? And what happens when he requests a computer game we forgot to pack?

Taking it a step further, what happens when the computer is no longer satisfied going only on camping trips? What happens when it starts insisting on going to basketball games? And restaurants? How about to the movies? Will it demand a voice in choosing the movie? What will happen when I want to see Fred Astaire sing "A Fine Romance" and the computer wants to see Tron? Bob Dylan is coming to town soon. Will the computer demand an $18.00 ticket? Will it try to outdo Dylan with a poetry generating program?

The implications, my friends, are vast. Computers could take over the world, and it could start with a simple camping trip. So I propose that we establish the

Randy's new camper van proves to double as a computer van, much to the Computer Widow's dismay.

"Save the Woods Foundation", an organization to work toward keeping computers out of areas of scenic beauty.

Incidentally, when we arrived at Honeyman Park and checked in at the main entrance, the young lady who assigned us our campsite used a computerized reservation and cash register system which gave her nothing but trouble.

Jessie Honeyman, for whom the park was named, was a pioneer woman who worked tirelessly to preserve Oregon's natural beauty for the public to enjoy. What would she say if she knew that computers were taking over; if she knew that campers were coming to *her* park with yards of wires to connect devices that distract the innocent and guilty alike from the 500-foot-high sand dunes and crystal clear lakes? Yes, friends, we must "Save the Woods". Your contribution could save mankind.

■

BASIC Program Listing For A Symbolic Disassembler

by David Shiloh

There is no question that machine language (ML) programming today is more difficult than BASIC programming. The reason for this, however, is largely in the pseudo-mystique that has surrounded the art; moreso in the difficulty of obtaining the assembler source code of working programs for study.

Machine language deals directly with data in a few simple, flexible ways, while BASIC manipulates data indirectly in more rigid and complicated ways. In this respect, machine language is actually much simpler than BASIC, and much easier to work with.

On the other hand, BASIC programs are written and executed in the same language (from the users point of view), while machine language programs are written in assembler language, and from that source code, they are assembled into the runable program that we use. Like a compiled BASIC program, assembled machine language is virtually unreadable except by the computer. What is needed for understanding is the readable language — the assembler file.

The readable assembler source code of a successful commercial program or operating system (Commodore's 1541 Disk Operating System is a case-in-point) is concealed "in-house" for competitive business reasons and protected from unauthorized publication by copyright laws. Computer hardware and software houses, through consultants, routinely reconstruct the code of others' software — not for publication, of course, but in search of innovations.

The program introduced in this article, Decode, delivers labeled assembler source code to the screen and to printer or disk, from the machine language program file on your disk. The disk output is available in two widely-used formats: linked PRoGram files for use with assembler systems such as LADS, PAL, MAE, etc., and SEQuential files for Commodore's Assembler Development System and the like.

PRoGram files can be edited like a BASIC program or modified with a progamming utility such as BASIC Aid, and frequently can be immediatly reassembled by LADS into a clone of the original without editing. The SEQuential type output may even make it possible for you to use your favorite word processor.

Byte blocks — vectors, messages, high-resolution screens and other machine language "data statements" — are distinguished from program code into lines of decimal bytes, followed by hex equivalents. Any instructions addressing those bytes produce special "offset" labels.

Label definitions of all zero page, outside, and offset operands are put at the beginning of the output file, followed by an index of all byte blocks and the labeled assembler code with lines of tabled byte blocks.

The result is a "machine language" program that can be read, edited, studied and *altered* as readily as a BASIC program, and then reassembled into your own specific applications programs.

Entering Decode

Decode uses control characters to format output. CTRL-A and CTRL-H are sent to the start of every disk output file from lines 80 and 124, as the load address $0801 (2049). In line 9, two CTRL-D characters are sent to the disk file as dummy line links. CoMmoDoRe-D is used in line 124 to send CHR$(172), the BASIC token for multiply ("*"), which many assemblers expect as the label for the start address or origin for the program counter. (CHR$(128) in line 140 sends the BASIC token for "END" to indicate an end of the source code.) Decode does not change your screen, border, or character colors, disable the STOP or RESTORE keys, or otherwise lock up your computer.

Using Decode

Decode's setup screen has nine elements:

```
(1)  ASSEMBLER FILE TO PRINTER
     OR DISK OR TO SCREEN ONLY?  d
(2)  DECODE PROGRAM?
        (the ML program)
(3)  LOAD ADDRESS:          $
     START DECODING AT?     $
        (default: load address)
(4)  DECODE THROUGH TO?     end
(5)  ASSEMBLER FILE?
        (output file)
(6)  HEX ADDRS TO FILE?     n
(7)  LABEL ALL OUTSIDE?     y
(8)  $2c = BYTE OR SKW:
     CHANGE SKW TO BIT?     y
(9)  ESCAPE BYTE BLOCK
     AFTER HOW MANY OP
     CODES ENCOUNTERED?     15
```

(1) Selects output. (2) Asks for the name of the machine language program you wish to Decode. Decode opens the program file, displays the load address in decimal and hex, and (3) offers the load address as the start of Decoding. You may start Decode anywhere in the ML program and (4) continue to wherever you want the output to stop. Decode will accept decimal or hex input for start and finish addresses.

(5) Asks for a name for your printer listing or disk assembler files. If you are sending to disk, (6) offers the option of sending hex addresses to the file after the line numbers. Selecting this option also reduces the number of lines by 25%, so that the output program will fit into BASIC RAM.

(7) Gives you an opportunity to limit labeling on outside operands to JMP (jump or GOTO) and JSR (jump to subroutine or GOSUB) instructions. Labeling all outside operands will tell you immediately whether your program uses the SID, VIC-II, and CIA chips directly, among other things. This option is useful for locating the call addresses (from within partial Decodes) of internal subroutines and jump targets.

(8) Allows you to restore absolute addressing for the BIT $2C op code, which is often used as a skip-word (SKW) operation since it tests a location without changing any registers. For purposes of locating the byte blocks, Decode presently considers both the BIT $2C and the BRK $00 instructions as bytes. If your ML program directly controls the serial bus or RS-232 interface, the BIT $2C instruction will be used to test Input/Output (I/O) registers and should be restored.

(9) Sets the number of properly spaced op codes that Decode must find before concluding that the end of a byte block has been found. Lowering the number may uncover smaller sections of program code — or may only produce garbage "code" that actually is part of a byte block. If you have too many byte blocks with garbage in between, raise the number.

After you've chosen your options, Decode goes to work. In Pass 1, it counts the file bytes to find the end address, identifying the byte blocks along the way with a branching loop called by the first non-instruction/operand byte found. It remains in this loop until it finds the number of consecutive valid instructions set in option 9, at which point it marks the address preceding the first of these as the end of the byte block.

During Pass 2, Decode constructs two label tables for locations within and outside the program that are addressed as operands by the instruction op codes. For example, "JSR $0B1E" will generate the label "AD0B1E." If location $0B1E contains "LDA #$FE" then the output lines will read "JSR AD0B1E" and "AD0B1E LDA #$FE" respectively. The instructions (without their addressing modes) and operands are displayed during this pass: a checkmark indicates a label already in the array; neither check nor label indicates that the operand is immediately addressed. This is the first chance to get an idea of the program's workings and identify "instructions" that are actually byte blocks.

In Pass 3, the inside labels are tested to identify those that will not appear within the assembler file — an instruction "DEC $0B1F" will decrement the #$FE in our example above, but location $0B1F, since it is part of the instruction at $0B1E, will not get labeled. Vectors and messages in byte tables and instructions hidden under BIT intructions will also be identified. These "offset labels" are often an indication of self-modifying code, while offset labels within byte blocks not infrequently locate small sections of code.

On Pass 4, Decode churns out its results. Disk files created by Decode begin with the start address of the Decode, followed by identification of the ML file being Decoded, a disabled ".d" (disk output) pseudop for the LADS Assembler, and an active ".s" (screen output) pseudop. These are included because I have been using this particular assembler. You will have to remove them during the editing process for assemblers that do not recognize them. The output file continues with Zero Page labels, outside labels, offset inside labels, an index of byte blocks, and the labeled assembler program code.

When Decode has finished, you can run your assembler on your new files to find any labeling errors (e.g., BIT $00A9 will appear as BIT AD00A9 while the label table will show ZA9) or other problems with Decoding (e.g., BIT $00A9 will assemble as BIT $A9 and throw all vectored addressing off by one byte) before attempting to re-create the ML program. Edit your assembler file, remove the disabling semicolon from the .d pseudop, and assemble a working clone of the original ML program: you will then have readable assembly language source code to change to your liking.

Once you have reconciled and internalized the offset labels, located and replaced vector tables with their appropriate labels, and internalized buffers and flag bytes that precede or follow the program code, your program will be entirely relocatable by simply changing the start address in the first line.

Critical Variables

In addition to the menu options, there are several variables that may be changed when conditions warrant. The C>A comparison in lines 56 and 135 checks the size of the disk output file. A is set to 1600, used to dimension the label arrays, changed to 1200 when the hex-to-disk option is selected, and tested during every loop in pass 4. Redefine A after line 101 to change the number of lines per file, and thus the file size. Current files are roughly 100 blocks. Assembler editors are usually more generous than word processors about

the size of the files they will accept. If you want the conveniences offered by your word processor, you will probably need to reduce this file size.

When Decoding above address 63999 ($F9FF), the disk output file will not allow editing by the BASIC line editor. The variable for this is in line 9: change

```
H%=L/O:F=L-H%*O
```

to

```
H%=C/O:F=C-H%*O
```

and the files will be numbered 0 to 1600. Change the `C=C+1` in line 9 to adjust the line number step to your liking for these files. Increasing the step will reduce the size of the output file, so adjust in the variable A (above), after line 101, and the counters in lines 56 and 57 for byte lines.

Disk output files are roughly eight times the size of the ML file Decoded. A sizeable program (over 20K) will overflow the disk and crash Decode with the last file unclosed on the disk. Screen output will continue, with "disk full" messages between the lines. Shut down and examine the last closed file written, restart Decode on a fresh disk at the next program address. It was simply not economical to trap this condition at the expense of examining the 1541 RAM at every output loop, especially since it would require a restart with a partial Decode even if trapped.

Reading the Assembler Files

The labels and byte table index at the beginning of the output file serve as a map of the program, showing the memory locations on which the code operates. When label `Z01 = $01` appears, it is probable that the ROM chips are switched in and out by the program; similarly labels `AD0314` and `AD0315` indicate an alternate interrupt routine. When you locate labels like these or BASIC ROM or KERNAL jump table labels in the assembler file, you can get a pretty good idea of what the program is doing at that point.

A series of closely-spaced outside labels immediately follows the end of the program. These labels are buffers, flags, and other data tables for the program. The labels need to be moved to the end of the assembler file and "internalized" in order to make the code relocatable.

Similarly, a vector table — which appears as a byte block — must be identified and converted to the form ".byte #<target" and ".byte #>target" before the program can be reassembled at another start ad-

dress. Offset labels and the absence of labels following byte blocks assist in this.

Byte blocks reassemble exactly, but need to be identified and understood in order to work with the program. Examine the op codes immediately preceding a byte block until you find the JMP, RTS, RTI or branching instruction that keeps the program from running into the block. Any EOR, LSR, ROL or other "instructions" following the escape are actually part of the byte block. Similarly, at the end of a byte block, instructions before the next labeled address are either still in the actual byte block or one is the target of a jump from a vector table. "Instructions" that are actually bytes usually result in the addition of false labels to the arrays.

Programming Notes

Decode employs a number of BASIC programming techniques that can be readily applied to other BASIC programs.

The use of control characters (CTRL-x, etc.) instead of the BASIC CHR$(x) command saves both space and interpreter time in execution.

The decimal-to-hex and hex-to-decimal routines (lines 5 and 89-90) are the most compact I have seen.

Placement of the subroutines at the beginning of the program in the sequence of their heaviest use resulted in an execution speed-up of approximately 6% compared with placement in the main loop following the calling instructions. Similarly, stating variables early in a use sequence yielded faster execution: lines 91–93 illustrate that a separate

```
[variable=.]
```

or

```
[string=""]
```

is not needed for each variable to be established.

In Pass Two, the internal label array is searched from top to bottom, while the external array is searched from bottom to top. Branching instruction targets (internal and always near the current top) are common late in a program, while zero-page (external) targets are more frequent than KERNAL calls. Changing the internal search to a downward search resulted in a 23% increase in speed for Pass Two.

Lines 1 through 90, consisting of 36 subroutines, contain 45 entry points from the main loop: the routines starting at lines 3, 4, 6, 7, 68, 69, 75, and 85 "fall through" to independent subroutines called separately by other parts of the program. Lines 1 through 7 are called from 103 places in the program, each is an entry for a particular use of the subroutines there.

"IF-THEN-ELSE" is simulated by ON-(condition)GO, particularly in line 135, where an end-of-file test is followed by an output-file-size test.

Compiling Decode

In its second pass through the program file, Decode constructs label arrays by performing floating-point comparisons. The number of comparisons increases with the number of labels, for up to 3200 labels: when you are Decoding 1K, this pass takes 4 minutes; 6K, 35 minutes; 18K, over three hours. For this reason, I use a compiled version of Decode which performs this pass in 90 seconds for 1K, 12 minutes for 6K, and one hour for 18K and will Decode large files two to three times as fast as Decode in BASIC.

Results

I successfully tested Decode by reassembling SpeedScript, Micromon (Bill Yee, 1983), Turbodisk (Lewis, 1985), Lightning Sort (Gaspard, 1984), and DOS Manager v5.1 (Fairbairn: CBM, 1982), from Decode output with little or no editing; and by producing complete source files for CBM's 1541 DOS V2.6, two versions of the C-64 KERNAL ROM, CompuServe's Vidtex (1984, 71 blocks), Cosmi's Caverns of Khafka (150 blocks), CBM's Sky Travel loader, and a variety of routines read from "protected" disks with output directed to a second disk drive (device 9).

Decode-generated assembler files were used to revise CBM's CP/M boot to load a reconstructed KERNAL version 1 to run CP/M on the C-64; to modify the LOGO boot to include Turbodisk; and to develop serial routines for fast disk access other than loads.

Decode, in short, has proved to be the missing link for me, and has delivered readable (and often assembler-ready) source code on every program tested.

■

Decode V1.0 produces output compatible with any assembler. For assemblers using PRoGram files for source code — LADS, PAL, MAE, etc. — some minor editing of the present output file will be necessary to meet the syntax requirements of the various program-based assemblers. To produce output for Commodore's Macro-Assembler and other assembler systems using SEQuential files for source code, substitute the lines below for the corresponding lines in the original listing.

```
9 print#2,p$:c=c+1:goto12
80 gosub81:l=l-3:p$=b$+g$:goto7
81 ifo$="d"thenp$="0:"+g$+",s,w":r%=r%+1
:open2,8,3,p$:c=z%:goto12
84 print#2:close2:goto12
124 p$="org= $"+h$:gosub6:p$:b$+c$:gosub
6:p$=b$:gosub6
140 p$=b$:gosub6:p$=".end "+c$
```

DECODE V1.0 Listing

by David Shiloh

```
0 goto91
1 get#1,a$:q=asc(a$+z$):p=p+1:return
2 n$=m$(q):n=a%(q):return
3 gosub1:k=q:h=1:goto5
4 gosub1:z=q:gosub1:z=z+q*o:k=z:h=3
5 h$="":form=z%toh:d=k:k=int(d/16):d=d-k
*16:h$=chr$(d+48-7*(d>9))+h$:next:return
6 l=l+1:ifl>gthenl=g
7 printl;:ifl>=sthenk=l:h=3:gosub5:print
t$h$i$;
8 printp$:on-(o$="s")goto13:on-(o$="p")g
oto10:iff%thenifl>=sthenp$=t$+h$+i$+p$
9 h%=l/o:f=l-h%*o:print#2,"[2 ctrl-d]"ch
r$(f)chr$(h%)p$z$;:c=c+1:goto12
10 ifl>=sthenp$=t$+h$+i$+p$
11 print#2,mid$(str$(l),2)i$p$
12 input#3,k,e$,d,d:ifkthenprinte$
13 return
14 x=z%:if(x%)orn=2thenifj<>32andj<>76an
dj<>108thenx=1
15 return
16 ifp>b(w)thenw=w+1:goto16
17 return
18 gosub16:printr$"s"e(w)-b(w)+1;:ifp+1>
e(w)thenreturn
19 fori=p+1toe(w):gosub1:next:return
20 gosub3:z=q:j=q:ifn=3thenz=p+q+(q>127)
*o+1:k=z:h=3:gosub5:printt$h$"[3 spc]";
21 if(n=3)and(z<sorz>e)thenreturn
22 ifn<>3thenprintt$h$"[5 spc]";:goto29
23 goto25
24 gosub4:printt$h$"[3 spc]";:ifz<sorz>e
then
29
25 fori=vtoz%step-1:ifz<i(i)then28
26 ifz=i(i)theni=z%:print"[shift-@]i";:g
oto28
27 forq=v+1toi+2step-1:i(q)=i(q-1):next:
i(q)=z:i=z%:v=v+1:printv"internal";
28 next:return
29 gosub14:ifxthenreturn
30 l%=1:fori=z%tou:ifz>o(i)then33
31 ifz=o(i)thenl%=z%:i=u:print"[shift-@]
o";:goto33
32 forq=u+1toi+1step-1:o(q)=o(q-1):next:
o(q)=z:i=u:u=u+1:l%=z%:printu"external";
33 next:ifl%theno(i)=z:u=u+1:printu"exte
rnal";
34 return
35 p$=q$:goto7
36 gosub1:k=q:h=1:gosub5:p$=q$+"#$"+h$:g
oto7
37 gosub1:z=p+q+(q>127)*o+1:k=z:h=3:gosu
b5:ifz<sorz>ethenp$=q$+t$+h$:goto7
38 p$=q$+v$+h$:goto7
39 gosub3:p$=q$+"z"+h$:goto7
40 gosub3:p$=q$+"z"+h$+",x":goto7
41 gosub3:p$=q$+"z"+h$+",y":goto7
42 gosub4:p$=q$+v$+h$:on-(z>=sandz<=e)go
to7:gosub14:ifxthenp$=q$+t$+h$
43 goto7
44 gosub4:p$=q$+v$+h$+",x":ifz>=sandz<=e
then7
45 gosub14:ifxthenp$=q$+t$+h$+",x
46 goto7
47 gosub4:p$=q$+v$+h$+",y":ifz>=sandz<=e
then7
48 gosub14:ifxthenp$=q$+t$+h$+",y
49 goto7
50 gosub4:p$=q$+"(ad"+h$+")":goto7
51 gosub3:p$=q$+"(z"+h$+",x)":goto7
52 gosub3:p$=q$+"(z"+h$+"),y":goto7
53 p$=left$(q$,len(q$)-1):goto7
54 gosub16:k=j:h=1:gosub5:p$=q$+r$+str$(
j):m$=";[3 spc]$"+h$:b=p:goto57
55 gosub1:k=q:h=1:gosub5:p$=p$+str$(q):m
$=m$+" $"+h$
56 ifp>b+6thenl=b:p$=p$+m$:gosub7:c=c+5:
on-(c>a)gosub79:b=p+1:p$=r$:m$=";[3 spc]"
57 ifp+1>e(w)thenl=b:p$=p$+m$:c=c+5:on-(
len(m$)>4)goto7:k=z%:c=c-5:return
58 goto55
59 gosub16:ifp+1>e(w)then62
60 form=p+1toe(w):gosub1:ifp=i(i)thengos
ub67
61 next
62 w=w+1:return
63 ifp+1=i(i)thengosub67
64 goto1
65 ifp+1=i(i)orp+2=i(i)thengosub67:goto6
5
66 gosub1:goto1
67 v%=v%+1:u=u+1:o(u)=i(i):printi(i)v%l$
:i=i+1:return
68 b=b-p*(b=z%):gosub1:r=st:ifrthenb=p+(
p>g):goto72
69 b=b-p*(b=z%):gosub1:r=st:ifrthenb=p+(
p>g):goto72
70 b=b-p*(b=z%):ifrthenb=p+(p>g):goto72
71 bi=bi+1:ifbi<bethenreturn
72 b=b-p*(b=z%):printb-1;b-b(w):e(w)=b+(
r=z%):bf=z%:bi=z%:b=z%:w=w+1:return
73 bi=z%:b=z%:on-(r<>z%)goto72:return
74 b(w)=p:bf=1:bi=z%:b=z%:printp;r$"s";:
return
75 p%=p%+1:print"[dwn][rvs on]pass"p%"[d
wn]":p=y-3
76 close1:open1,8,2,f$:gosub4:ifp%<1then
12
77 ifp<(s-1)thengosub1:goto77
78 goto12
79 p$=b$:gosub6:g$=c$+mid$(str$(r%),2):p
$=".file "+g$:gosub6:gosub84
80 gosub81:print#2,"[ctrl-a][ctrl-h]";:l
=l-3:p$=b$+g$:goto7
81 ifo$="d"thenp$="0:"+g$+",p,w":r%=r%+1
:open2,8,3,p$:c=z%:goto12
82 ifo$="p"thenopen2,4:print#2,mid$(f$,3
,len(f$)-6)":  decode
83 return
84 print#2,z$z$;:close2:goto12
```

```
85 input"decode through to  end[5 left]"
;d$:goto87
86 print"[2Ø spc]"h$:input"[up]start dec
oding at  $[3 left]";d$
87 k=z%:on-(left$(d$,1)=t$)goto88:k=val(
d$):return
88 d$=right$(d$,len(d$)-1):iflen(d$)=z%t
henreturn
89 forh=1tolen(d$):d=asc(mid$(d$,h,1)):d
=d-48+7*(d>57):k=k+d*(16
9Ø next:d$="":return
91 a$="":q=p:z$=chr$(k):e=i:i$=" labels"
:l=z:p$=q$:j=m:h%=f:n=z%:h$=o$:n$=e$
92 h=3:t$="$":v$="ad":a=16ØØ:d=x%:x=c:o=
256:f%=s:bc=w:l%=v:bf=r:bi=b:b$=";"
93 m$=c$:d$=f$:g=65535+be:b%=p%:r%=u+1:v
%=y:j$="inside"+i$:k$="outside"+i$:g$="
94 l$="offset"+i$:i$=" ":r$=".byte":prin
t"[clr][ctrl-n][ctrl-h][2 dwn][rvs on][1
7 spc]Decode v1.Ø "
95 dima%(o),m$(o),b(o),e(o),i(a),o(a):fo
ri=1to151:reada$,q,p:m$(p)=a$:a%(p)=q
96 next:open3,8,15,"i0":print"[dwn]assem
bler file to [rvs on]p[rvs off]rinter"
97 input"or [rvs on]d[rvs off]isk or to
[rvs on]s[rvs off]creen only  d[3 left]"
;o$:ifo$<>"p"ando$<>"d"theno$="s"
98 input"[dwn]decode program";f$:f$="Ø:"
+f$+",p,r":gosub76:y=z:ifkthen98
99 print"load address:"y;t$h$:gosub86:s=
k-y*(k=z%):gosub85:e=k-g*(k=z%):h=3
1ØØ ifo$<>"s"theninput"[dwn]assembler fi
le";c$:iflen(c$)>1Øthen1ØØ
1Ø1 ifo$="d"theninput"hex addrs to file
 n[3 left]";d$:ifd$="y"thena=12ØØ:b%=1
1Ø2 input"label all outside  y[3 left]";
d$:x%=-(d$="n"):print"[dwn]$2c = byte or
 skw:
1Ø3 input"change skw to bit  y[3 left]";
d$:a%(44)=-7*(d$="y")
1Ø4 print"[dwn]escape byte block":print"
after how many op
1Ø5 input"codes encountered  15[4 left]"
;d$:gosub87:be=k:gosub75
1Ø6 on-((p>=e)or(r<>z%))goto1Ø9:gosub1:r
=st:gosub2:ifbfthen1Ø8
1Ø7 onn+1gosub74,13,1,1,1,1,1,4,4,4,4,1,
1,13:r=st:goto1Ø6
1Ø8 onn+1gosub73,7Ø,69,69,69,69,69,68,68
,68,68,69,69,7Ø:goto1Ø6
1Ø9 t=p+(p>g):k=t:gosub5:e=e-(t-g)*(e=g)
:e(w)=e(w)-t*(e(w)=z%):print
11Ø print"high address:"t"($"h$")":print
"program code:"t-y+1"bytes
111 ifs<yors=>tthenk=y:gosub5:gosub86:s=
k-y*(k=z%):goto111
112 ife<yore>tthengosub85:e=k-t*(k=z%):g
oto112
113 gosub75:i(z%)=s:i(1)=t:v=1:o(z%)=z%:
b(w+1)=g:e(w+1)=z%:bc=w:w=z%
114 on-(p>=e)goto116:gosub1:gosub2:j=q:k
=p:h=3:gosub5:printp;t$h$i$n$i$;
115 onn+1gosub18,13,2Ø,2Ø,2Ø,2Ø,2Ø,24,24
,24,24,2Ø,2Ø,13:print:goto114
116 print:printv;j$:printu;k$:i(v+1)=g:o
(u+1)=g:gosub75:i=z%:w=z%:ifv<2then122
117 on-((p>i(v))or(p>=e))goto121:gosub1:
gosub2
118 ifp>i(i)theni=i+1:goto118
119 ifp=i(i)theni=i+1
12Ø onn+1gosub59,13,63,63,63,63,63,65,65
,65,65,63,63,13:goto117
121 ifv%thenprintv%l$
122 gosub75:c$=c$+".src":g$=c$:gosub81:l
=9:w=z%:k=p+1:gosub5:h=1
123 ifo$<>"d"thenp$="*= $"+h$+i$+c$:gosu
b7:on-(u=z%)goto134:goto126
124 print#2,"[ctrl-a][ctrl-h]";:p$="[cmd
r-d]= $"+h$:gosub6:p$=b$+c$:gosub6:p$=b$
:gosub6
125 p$=";.d r/"+mid$(f$,3,len(f$)-6):gos
ub6:p$=".s":gosub6:ifu=z%then134
126 p$=b$:gosub6:p$=";zero page":gosub6:
fori=z%tou:k=o(i):ifk>=otheni=u:goto128
127 gosub5:p$="z"+h$+" = $"+h$:gosub6
128 next:h=3:p$=b$:gosub6:p$=b$+k$:gosub
6:fori=1tou:k=o(i):ifk<othen131
129 gosub5:ifi=u-v%+1thenp$=b$:gosub6:p$
=b$+l$:gosub6
13Ø p$=v$+h$+" = $"+h$:gosub6
131 next:p$=b$:gosub6:ifbc=z%then134
132 p$=";byte blocks":gosub6:fori=z%tobc
-1:k=b(i):gosub5:p$="; $"+h$+"-$"
133 k=e(i):gosub5:p$=p$+h$+str$(e(i)-b(i
)+1):gosub6:next:p$=b$:gosub6
134 i=z%:f%=b%
135 on-(p>=e)goto14Ø:on-(c>a)gosub79:gos
ub1:j=q:gosub2:l=p:q$="":m$="
136 ifp>i(i)theni=i+1:goto136
137 ifp=i(i)thenk=p:h=3:gosub5:q$=v$+h$+
i$:i=i+1
138 ifn<>z%thenq$=q$+n$+i$
139 onn+1gosub54,35,36,37,39,40,41,42,44
,47,5Ø,51,52,53:goto135
14Ø p$=b$:gosub6:p$=".end "+c$:ifo$="d"t
henp$="."+chr$(128)+i$+c$
141 gosub6:on-(o$="d")gosub84:close3:clo
se2:close1:print"[dwn][ctrl-i]complete
142 databrk,,,ora,11,1,ora,4,5,asl,4,6,p
hp,1,8,ora,2,9,asl,13,1Ø,ora,7,13,asl
143 data7,14,bpl,3,16,ora,12,17,ora,5,21
,asl,5,22,clc,1,24,ora,9,25,ora,8,29
144 dataasl,8,3Ø,jsr,7,32,and,11,33,bit,
4,36,and,4,37,rol,4,38,plp,1,4Ø,and,2
145 data41,rol,13,42,bit,,44,and,7,45,ro
l,7,46,bmi,3,48,and,12,49,and,5,53
146 datarol,5,54,sec,1,56,and,9,57,and,8
,61,rol,8,62,rti,1,64,eor,11,65,eor,4
147 data69,lsr,4,7Ø,pha,1,72,eor,2,73,ls
r,13,74,jmp,7,76,eor,7,77,lsr,7,78,bvc
148 data3,8Ø,eor,12,81,eor,5,85,lsr,5,86
,cli,1,88,eor,9,89,eor,8,93,lsr,8,94
149 datarts,1,96,adc,11,97,adc,4,1Ø1,ror
,4,1Ø2,pla,1,1Ø4,adc,2,1Ø5,ror,13,1Ø6
15Ø datajmp,1Ø,1Ø8,adc,7,1Ø9,ror,7,11Ø,b
vs,3,112,adc,12,113,adc,5,117,ror,5,118
151 datasei,1,12Ø,adc,9,121,adc,8,125,ro
r,8,126,sta,11,129,sty,4,132,sta,4,133
152 datastx,4,134,dey,1,136,txa,1,138,st
y,7,14Ø,sta,7,141,stx,7,142,bcc,3,144
153 datasta,12,145,sty,5,148,sta,5,149,s
tx,6,15Ø,tya,1,152,sta,9,153,txs,1,154
154 datasta,8,157,ldy,2,16Ø,lda,11,161,l
dx,2,162,ldy,4,164,lda,4,165,ldx,4,166
155 datatay,1,168,lda,2,169,tax,1,17Ø,ld
y,7,172,lda,7,173,ldx,7,174,bcs,3,176
156 datalda,12,177,ldy,5,18Ø,lda,5,181,l
dx,6,182,clv,1,184,lda,9,185,tsx,1,186
157 dataldy,8,188,lda,8,189,ldx,9,19Ø,cp
y,2,192,cmp,11,193,cpy,4,196,cmp,4,197
158 datadec,4,198,iny,1,2ØØ,cmp,2,2Ø1,de
x,1,2Ø2,cpy,7,2Ø4,cmp,7,2Ø5,dec,7,2Ø6
159 databne,3,2Ø8,cmp,12,2Ø9,cmp,5,213,d
ec,5,214,cld,1,216,cmp,9,217,cmp,8,221
16Ø datadec,8,222,cpx,2,224,sbc,11,225,c
px,4,228,sbc,4,229,inc,4,23Ø,inx,1,232
161 datasbc,2,233,nop,1,234,cpx,7,236,sb
c,7,237,inc,7,238,beq,3,24Ø,sbc,12,241
162 datasbc,5,245,inc,5,246,sed,1,248,sb
c,9,249,sbc,8,253,inc,8,254
```

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BASIC ALLEY:
Questions Answered FRE(Ø)

by Bob Richardson

The middle of July has sizzled its way into our homes. It's time to get in some last-minute programming before our power supplies overheat and die. What? You can't finish your program because you have a burning question? Send it in *fast* while your computer still works. And the millionth letter writer gets a free Timex/Sinclair 1000!

Q — The INPUT statement is OK for my own programs, but how can I guarantee that no one can foul up my programs by entering letters instead of numbers, or a number that is too large?

A — The best solution is to replace the INPUT statement entirely with your own subroutine. This allows you complete control over the user and complete freedom to process the input data. Try putting this routine at the end of your program:

```
1000 in$=""
1010 printchr$(18);chr$(32);chr$(146);ch
r$(157);:rem display cursor
1020 geta$:ifa$=""then1010
1030 ifa$=chr$(13)thenprintchr$(32):retu
rn:rem return key pressed
1040 ifa$=chr$(20)then1100:rem delete ke
y pressed
1050 iflen(in$)>=lnthen1010:rem string t
oo long
1060 if(a$<" "ora$>"z")and(a$<"A"ora$>"Z
")then1010:rem check range
1070 rem note capital "A" and "Z" in lin
e 1060
1080 in$=in$+a$:poke212,0:printa$;:rem p
oke 212,0 disables quote mode
1090 goto1010
1100 ifin$=""then1010
1110 in$=left$(in$,len(in$)-1):rem remov
e last character from string
1120 printchr$(157);chr$(32);chr$(157);c
hr$(157);chr$(32);chr$(157);
1130 rem line 1120 deletes char on line
without disturbing rest of screen
```

There you have it — a complete input routine that disables all control characters, and removes bugs from the quote mode. This routine uses two variables: LN is the maximum number of characters allowed in the string (this can be from 1 to 255) and is set *before* your program GOSUBs line 1000. When the user hits RETURN, IN$ is sent back to your program containing all valid characters that were typed. Note that the current program is set to run in the upper-/lower-case mode. If you wish to use the regular upper-case/graphics display, change line 1060 to read:

```
1060 if(a$<" "ora$>"z")then1010
```

If your program expects a number instead of a string, use this format:

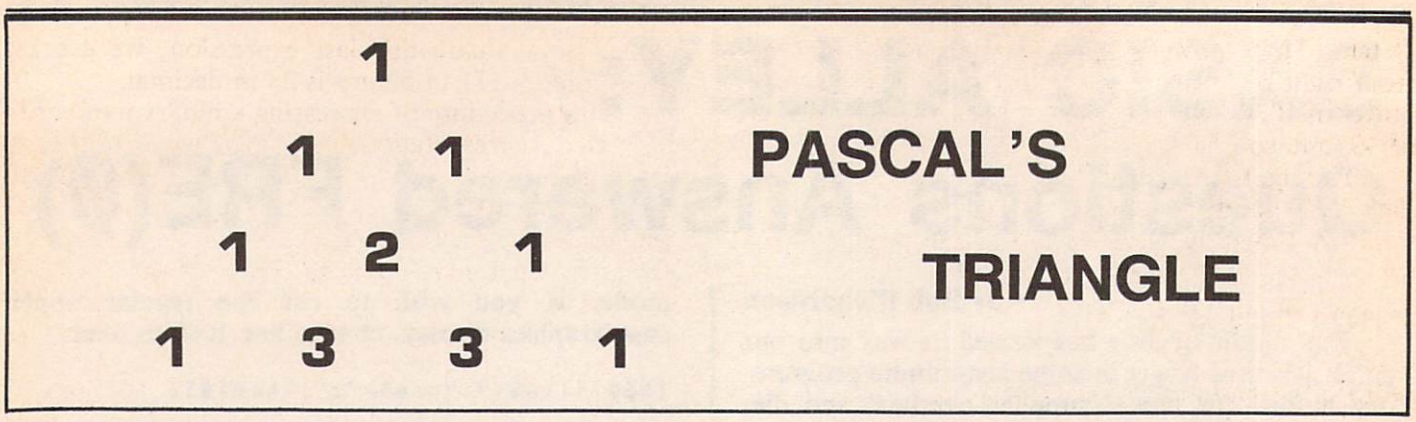
```
500 gosub1000:rem call input routine
501 x=val(in$):rem convert string to num
eric variable
502 rem x is any variable used by your p
rogram
```

And, finally, if you want to be *sure* that the user can't crash your program by entering a number like 99e99 which will result in an overflow error, adjust line 1060 to accept only numeric input:

```
1060 if(a$<"0"ora$>"9")then1010
```

Remember to set LN to the maximum number of digits your program can handle. If you forget, the routine will not allow the user to type *any* characters! Also remember, if worst comes to worst: Always have fun!

■



Powers, Part I: BINTODECTOBIN

by Carmen Artino

Bintodectobin!! What a way to begin an article! Perhaps I should have said, "Binary-to-decimal-to-binary". Or, "How to Convert Binary to Decimal and Decimal to Binary". Much too long, I prefer BINTODECTOBIN. But what, pray tell, has this to do with powers?

My ultimate goal in this next series of articles is to present an algorithm for computing b^x, a facility left out of standard Pascal. I know, you can compute b^x by computing:

```
EXP(x*LN(b))
```

(you *do* know that, don't you?) But then again, we have something to learn by looking at such an algorithm. Besides, `EXP(x*LN(b))` isn't any fun and the same thing can be accomplished in Pascal without calling the transcendental functions EXP and LN.

We will also learn a little more about our Commodore 64's and how a REAL number is internally stored by this gem (no pun intended) of a computer. But first we have to learn how we can convert BINTODECTOBIN!

You have probably read (or tried to read) many articles on the binary number system and how to go about expressing numbers in binary. I am going to present a rather simple method for accomplishing the same thing but with a twist; the reverse of the method will convert the number back to decimal.

It is also quite general so that it can be modified to convert a number in any number system to any other. If you already know a method for converting one form of a number to the other, great. But read on anyway, my method may be different from yours and you will have learned something. If you know a method you think is better, let me know; I like to learn new methods, too.

A number has no intrinsic representation but since numbers are useful items, we need to have convenient ways to represent them. These representations are accomplished through the use of symbols. In our commonly used system of representation, we use the following ten symbols, also called digits or numerals: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 and various combinations of them. Hence the name, the decimal system.

"Deci" in Latin means ten. Forty-nine, for example, is represented using these symbols as 49. In other times and in other cultures, different systems and symbols were used. The ancient Romans, for example, represented forty nine by XLIX. Their symbols were different but their system of representation was basically decimal in nature. In time, their method of representation fell out of favor because it was awkward and ambiguous. Just try writing one million using Roman numerals!

The decimal system of representing numbers in use today differs from the Roman system in that it is also a *place* system. This means that the place a symbol occupies in the representation is important to its meaning. For example, the 4 in 49 has a different meaning than the 4 in 94; the two 4's in 4074 are not ambiguous because of the places they occupy.

The place system gives numbers an explicit meaning. For example, 4074 means 4 thousands, 0 hundreds, 7 tens, and 4 units. We know this because of the place or position each digit in 4074 occupies; each place is occupied by a power of 10, the *base* of the

system. These powers of 10 increase as we proceed from right to left; the right-most place is the zeroth power of 10, the next right-most place is the 1st power of 10, and so on.

The right-most digit is called the least significant digit (LSD) and the left-most digit is called the most significant digit (MSD). We can therefore write 4074 as:

4*1000 + 0*100 + 7*10 + 4

or, as:

$4*10^3 + 0*10^2 + 7*10^1 + 4*10^0$.

The exponents 0 and 1 are usually not written because $10^1 = 10$ and $10^0 = 1$ so that 4074 is written as $4*10^3 + 0*10^2 + 7*10 + 4$. When we evaluate this last expression we, of course, come up with 4074.

The place representation is common to all systems of numeric representation used today. The decimal system based on ten symbols is a good one because the number of primitive symbols; *i.e.*, the ten digits, allows for a reasonable representation of any quantity. For example, four digits are needed to represent a quantity in the thousands using the decimal system but in the binary system, at least ten "bits" are necessary to represent a quantity that large.

There are, however, many reasons why we would want to use another method of representation such as the binary system. It is, in many ways, more natural to use in certain contexts. For example, any time we wish to express an idea that has two "states", the binary system would naturally come to mind.

What are some of these two-state ideas? How about on-off as in a switch or charged-not charged as in electronic components? Then there's open-closed as in a gate (not the gate on your fence, I mean a gate as in a *logic gate*); and don't forget true-false, etc. You can probably think of others.

There are two primitive symbols used in the binary system: 0 and 1 ("bi" means two). I refrain from using the term "digit" here because of its association with the decimal system (our fingers, for example, are called digits because there are ten of them). The term "bit" is often used to describe the binary numerals because it is suppose to be a short form of the phrase, BInary digiT. Sounds logical, I suppose, but for a more colorful anecdote which claims to be the source of the term bit, see the end of the article.

When we write a number in binary, such as 10111, each bit occupies a place which, this time, represents a power of 2. Thus 10111 may be written as:

$1*2^4 + 0*2^3 + 1*2^2 + 1*2 + 1$ or **$1*16 + 1*4 + 1*2 + 1$.**

When we evaluate this last expression, we get 23. Therefore, 10111 in binary is 23 in decimal.

This procedure of expressing a binary number in its place representation and then evaluating the resulting expression gives us the procedure we wish to use to convert BINTODEC. Doing it "by hand" is, of course, rather easy. However, to code the procedure in Pascal, we need to make it iterative and this is easily done if we modify, slightly, the way we evaluate the place represenation. Let's use 10111 (twenty-three), as an example, to illustrate. Since

$10111 = 1*2^4 + 0*2^3 + 1*2^2 + 1*2 + 1$,

we can repeatedly factor out the twos in this expression to rewrite it as follows:

$10111 = (((1*2 + 0)*2 + 1)*2 + 1)*2 + 1$.

Didn't get that? Let's take a closer look. In the expression

$1*2^4 + 0*2^3 + 1*2^2 + 1*2 + 1$

all the terms except the right-most have a common factor of 2. If we factor this out, we can write the expression as

$(1*2^3 + 0*2^2 + 1*2 + 1)*2 + 1$

Now look at the quantity between the parentheses in this last expression. All the terms there have a factor of two except the right-most. After factoring this two out, the expression may be written as

$((1*2^2 + 0*2 + 1)*2 + 1)*2 + 1$

If we repeat this procedure until the inner-most set of parentheses contains an expression with no common factors (of two of course), we will be done.

Once we have the binary representation of a number in this form, the Pascal code to convert it to decimal is easily written. But before doing so, let's ask ourselves how we would enter such a number into our computers.

Usually, we type the MSD first and continue typing until we have typed the LSD like so: **1 0 1 1 1 [RETURN]**. The MSD and the bit that follows it are the two bits in the inner-most set of parentheses (the 1 and the 0 in this case). The MSD is to be multiplied by 2 and the next bit is to be added to the result. This quantity is then the first value at the next level of parentheses.

This quantity will then be multiplied by 2 and the next bit will be added to it. This procedure is continued until there are no more bits to be read. The number of times the quantity is multiplied by two is one less than the number of bits in the binary number. It would be nicer, and easier to code, if the number of multiplications by two were *equal* to the number of bits to be read.

This can be accomplished by initializing the quantity to zero. To write the code, we will use the VAR dec: INTEGER to hold the decimal value and the VAR bit: CHAR to hold the bit values one at a time. Here is the code:

```
dec := 0;  (* intialize dec *)
WHILE NOT(EOLN) DO
  BEGIN
    READ(bit);    (* get a bit *)
    dec := 2 * dec;    (* multiply dec by
 2 *)
    IF bit = '1' THEN dec := dec + 1  (*
 add 1 to dec if the next bit is a 1 *)
  END
```

Note that we do not have to add the next bit if it is a zero since zero contributes nothing to the result. The loop ends when we have read all the bits of the binary representation; that is, when we reach end-of-line. A complete Pascal program with a few bells and whistles is given at the end of the article and incorporates this routine.

Let's turn our attention to DECTOBIN. The procedure here is just as simple except that we will divide instead of multiply. (I told you it was the reverse of BINTODEC!) To see how this routine works, we again need to refer to the expression,

10111 = (((1*2 + 0)*2 + 1)*2 + 1)*2 + 1

This time look at the expression enclosed by the outer-most set of parentheses and note that it has a factor of 2. So, if we divide 23 by 2, the quotient will be the expression enclosed by this outer-most set of parentheses and the remainder will be the LSD (a 1 in this example). Dividing the quotient by 2 again will give a quotient which is the expression in the next outer-most set of parentheses and a remainder which is the bit before the LSD.

The process is then repeated until no more divisions can take place. In this procedure it is important to note that we are generating the binary representation in the reverse order of that given above. That is, in converting BINTODEC, we start with the MSD and work until we reach the LSD. In converting DECTOBIN, we generate the LSD first and continue until we reach the MSD. In converting BINTODEC we multiply, in converting DECTOBIN we divide. Each conversion is the reverse of the other!

Here is the Pascal code which implements this routine for converting DECTOBIN. The binary representation is held in a

```
VAR binaryrep: ARRAY[1..15] OF INTEGER
```

and the decimal to be converted to binary is held in a `VAR dec1: INTEGER.`

```
READLN(dec1); i := 0;
WHILE dec1 <> 0 DO
  BEGIN
    i := i + 1;
    binaryrep[i] := dec1 MOD 2;
    dec1 := dec1 DIV 2
  END
```

That's all there really is to the conversion! Just remember to print binaryrep backwards because, you will recall, this routine gets the LSD first so it will be in binaryrep[1]. When the WHILE loop ends, the last value of the VAR i: INTEGER will hold the place value of the MSD. The binary representation can printed out in correct order using the following line of code:

```
FOR j := i DOWNTO 1 DO WRITE(binaryrep[j
]:1);
```

The following program employs the simple ideas given here; it just adds a few niceties like color, procedures, etc. The main routines for conversion are contained in PROCEDUREs called bintodec and dectobin.

As an aside, note that the following lines are used in a PROCEDURE called YesNo:

```
REPEAT
  response := GETKEY
UNTIL response IN ['y','n'];
```

They demonstrate how to write Pascal code that programs your C-64 to wait for a response from the keyboard, in this case, a response of y or n; any other response will have no affect. The function GETKEY used here is commoon to many Pascal compilers available for the Commodore 64. Put another way, these lines accomplish the same end that the following lines in BASIC (pardon my French) accomplish:

```
100 get x$: if x$ = "" then 100
110 if x$ <> "y" and x$ <> "n" then 100
```

Here is the complete program for converting from BINTODEC or from DECTOBIN:

```
PROGRAM convert(INPUT,OUTPUT);
CONST maxlen = 15;
TYPE bits = ARRAY[1..maxlen] OF INTEGER;
     chrbit = ARRAY[1..maxlen] OF CHAR;
VAR bit,request:CHAR;
    decimal,dec1,dec2,k:INTEGER;
    chrbinrep:chrbit;
    binaryrep:bits;
```

```
PROCEDURE message;
BEGIN
  WRITELN;
  WRITELN(chr(18),'B',chr(146),'INTODEC
or');
  WRITELN(chr(18),'D',chr(146),'ECTOBIN'
);
  WRITELN
END;
PROCEDURE bintodec;
VAR i:INTEGER;
BEGIN
  WRITELN('Enter a sequence of binary di
gits.');
  decimal := 0;i := 0;
  WHILE NOT(EOLN) DO
    BEGIN
      READ(bit);i := i + 1;
      chrbinrep[i] := bit;
      decimal := decimal * 2;
      IF bit = '1' THEN decimal := decim
al + 1;
    END;
  k := i;READLN
END;

PROCEDURE dectobin;
VAR i: INTEGER;
BEGIN
  WRITELN('Enter a positive decimal inte
ger.');
  READLN(dec1); dec2 := dec1;
  i := 0;
  WHILE dec1 <> 0 DO
    BEGIN
      i := i + 1;
      binaryrep[i] := dec1 MOD 2;
      dec1 := dec1 DIV 2
    END;
  k := i
END;

PROCEDURE writedecimal;
VAR j: INTEGER;
BEGIN
  WRITELN('The binary representation of
');
  FOR j := 1 TO k DO WRITE(chrbinrep[j]:
1);WRITELN;
  WRITELN('is',chr(18),decimal:6)
END;
PROCEDURE writebinary;
VAR j:INTEGER;
BEGIN
  WRITELN('The binary representation of'
,dec2:6,' is');WRITE(chr(18));
  FOR j := k DOWNTO 1 DO WRITE(binaryrep
[j]:1);WRITELN(chr(146))
END;

PROCEDURE YesNo;
BEGIN
  REPEAT
    request := GETKEY
  UNTIL request IN ['y','n']
END;

BEGIN (* main proogram *)
  PAGE;BORDER(2);SCREEN(2);PEN(1);
  WRITELN('Convert a number? (y/n)');
  YesNo;
  WHILE request = 'y' DO
    BEGIN
      message;
      REPEAT
        request := GETKEY
      UNTIL request IN ['B','D'];
      CASE request OF
       'B': BEGIN
             bintodec;
             writedecimal
            END;
       'D': BEGIN
             dectobin;
             writebinary
            END
      END; (* case *)
      WRITELN;WRITELN('Another conversio
n? (y/n)');
      YesNo
    END; (* WHILE *)
  WRITELN('OK');BORDER(14);SCREEN(6)
END.
```

As promised, here is the story which purports to be the source of the term, bit. Even if it is not true, it is certainly more colorful than BInary digiT.

When dealing with computers like the C-64 and C-128, we become accustomed to the fact that a byte consists of eight bits. This is true on other machines as well. For example, a 32-bit word main frame computer usually breaks the word down into four bytes, each of which consists, of course, of eight bits.

A few centuries ago, there was a coin made of soft metal so that it could be cut with a knife. The coin was usually cut into eight parts called — you got it — bits! The parts were referred to as "pieces of eight" and the coin became known by the same name. Thus the term bit came to be known as an eighth of a whole.

We still use the term today; "two bits" usually means 25 cents, one fourth of a dollar. Is the story true? I don't know; but, as mentioned above, it is certainly more colorful than BInary digiT. Anyone care to comment? Does anyone know the source of the story?

Addenda:

1. The program in this article was developed and prepared using the **Super Pascal 64** compiler from Abacus Software. This product will be reviewed in an upcoming column.
2. For those of you who do not wish to type in the program given here, I will be glad to send you a compiled, running copy of the program, the source code if you wish to compile it yourself, and a fully commented listing of the same. Just send me an appropriate mailer addressed to yourself, a disk or tape, and $3.00 if you stamp the mailer yourself or $5.00 if you want me to pay the postage.

   The author welcomes comments and suggestions concerning this column. The interested reader may write to the author at P.O. Box 43, Guilderland, NY 12084.

■

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How To Type In Program Listings From The Guide

In order to typeset programs so that clear images may be printed in the pages of *The Guide*, it was necessary to deal with the problem of graphics characters that appear on the screen when you type in a capital letter in graphics mode, or when you choose graphic symbols for colors (instead of using POKEs, which occupy more memory space in your programs), etc.

To begin with, all programs appear in the text mode. You enter the text mode by pressing the Commodore key and the shift key simultaneously. This solves the problem of capital letters.

The other graphic symbols are replaced with letters the typesetting machine can recognize. For example, if the program shows [lt grn], you simultaneously press the Commodore key and 6, causing the graphic symbol for light green to be shown on your screen.

We hope this helps clear up any confusion you may have experienced. If you have any questions, please feel free to contact us. Have fun!

Program Shows:	Press Keys:	Screen Shows:
[blk]	ctrl-1	
[wht]	ctrl-2	
[red]	ctrl-3	
[cyn]	ctrl-4	
[pur]	ctrl-5	
[grn]	ctrl-6	
[blu]	ctrl-7	
[yel]	ctrl-8	
[rvs on]	ctrl-9	
[rvs off]	ctrl-0	
[orange]	Cmdr-1	
[brown]	Cmdr-2	
[lt red]	Cmdr-3	
[gray 1]	Cmdr-4	
[gray 2]	Cmdr-5	
[lt grn]	Cmdr-6	
[lt blu]	Cmdr-7	
[gray 3]	Cmdr-8	
[clr]	Shft-Clr	
[home]	Home	
[up]	Crsr-Up	
[dwn]	Crsr-Down	
[left]	Crsr-Left	
[right]	Crsr-Right	
[f1]	f1	
[f3]	f3	
[f5]	f5	
[f7]	f7	
[up-arrow]	Up Arrow	↑

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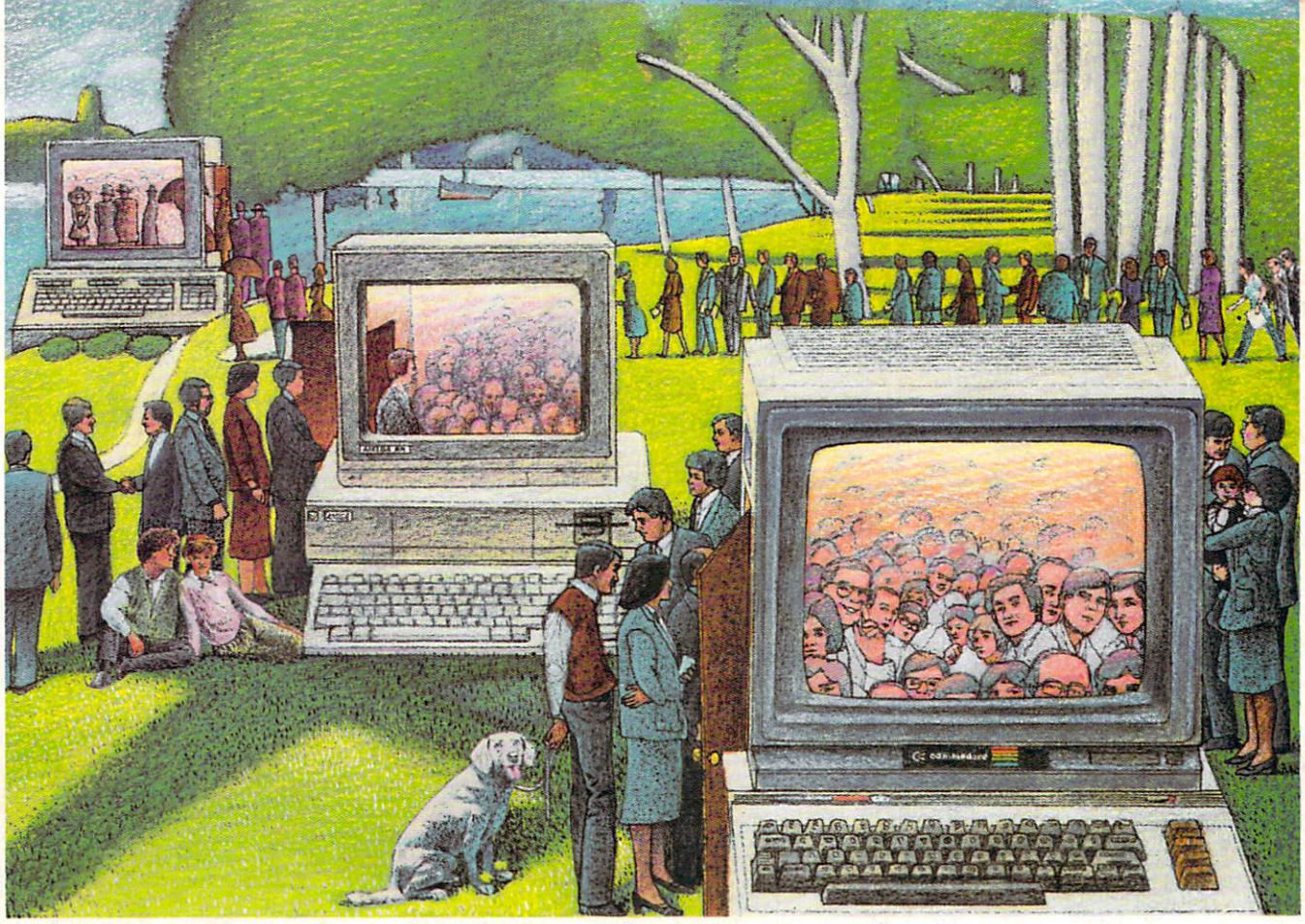

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